SHOUT
SHARE
IT

Calif
Dept. of Fish & Game
Biennial Rept.
1946 - 48

CALIFORNIA RESOURCES AGENCY LIBRARY
Resources Building, Room 117
1416 - 9th Street
Sacramento, California
95814

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
WARREN T. HANNUM, Director

# FORTIETH BIENNIAL REPORT

OF THE

# DIVISION OF FISH AND GAME

FOR THE YEARS 1946-1948

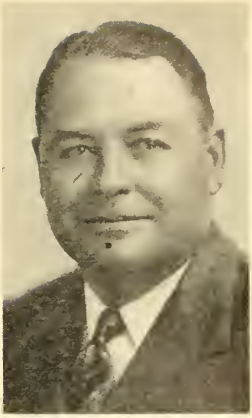
# CONTENTS


| | Page |
|---|---|
| LETTER OF TRANSMITTAL | 7 |
| REPORTS | |
| Fish and Game Commission | 9 |
| Executive Officer | 11 |
| Bureau of Patrol and Law Enforcement | 16 |
| Bureau of Marine Fisheries | 20 |
| Bureau of Fish Conservation | 50 |
| Bureau of Game Conservation | 65 |
| Bureau of Licenses | 74 |
| APPENDIX | 77 |
| Statement of Expenditures and Revenue | 79-104 |
| Arrests, Fines and Seizures | 105 |
| Marine Fisheries Statistics | 109 |
| Fish Distribution and Rescue | 113-115 |
| Game Statistics | 116 |
| Game Bird Releases | 118 |

## DEDICATION

*To state officials and legislators who have labored diligently to achieve a wise conservation policy for the protection of our natural resources, to the hunters, anglers and commercial fishermen who have harvested a portion of our crop of game and fish, and to other citizens who have enjoyed the great outdoors and association with the wildlife of the Golden State, this biennial report of accomplishments and progress is dedicated. May its perusal result in a firmer alliance of those who are striving for the protection and development of the wildlife resources of California.*

WARREN T. HANNUM
DIRECTOR OF NATURAL RESOURCES



HARVEY E. HASTAIN
PRESIDENT, FISH AND GAME COMMISSION

LEE F. PAYNE
COMMISSIONER

WILLIAM J. SILVA
COMMISSIONER

PAUL DENNY
COMMISSIONER

EDWIN L. CARTY
COMMISSIONER

E. L. MACAULAY
EXECUTIVE OFFICER

# LETTER OF TRANSMITTAL

July 1, 1948

To His Excellency, Earl Warren
Governor of the State of California
Sacramento, California

Sir: We, the members of the Fish and Game Commission, respectfully submit the Fortieth Biennial Report, covering the period July 1, 1946, through June 30, 1948.

The report is a brief resume of the activities of the Fish and Game Commission; a report by the Executive Officer; and detailed reports of the functions of the various bureaus by their respective chiefs. There also are included complete fiscal reports and tabulations on fish and game management.

Respectfully submitted,

California Fish and Game Commission
Harvey E. Hastain, President
Lee F. Payne
William J. Silva
Paul Denny
Edwin L. Carty

# REPORT OF THE FISH AND GAME COMMISSION

At the start of the biennium, the Fish and Game Commission consisted of:

| | |
|---|---|
| Lee F. Payne, President | Los Angeles |
| William J. Silva | Modesto |
| W. B. Williams | Alturas |
| Harvey E. Hastain | Brawley |
| H. H. Arnold | Sonoma |

Personnel changes in the Commission as effected during the following two years were:

Paul Denny, of Etna, appointed June 19, 1947, vice W. B. Williams, term expired.

Edwin L. Carty, of Oxnard, appointed April 27, 1948, vice H. H. Arnold, resigned April 6, 1948.

At the close of the biennium, the membership of the Commission was as follows:

| | |
|---|---|
| Harvey E. Hastain, President | Term expires 1951 |
| William J. Silva | Term expires 1950 |
| Lee F. Payne | Term expires 1952 |
| Paul Denny | Term expires 1953 |
| Edwin L. Carty | Term expires 1949 |

E. L. Macaulay was appointed Executive Officer of the Commission, May 10, 1948, following the resignation of Emil J. N. Ott, Jr., on April 30, 1948.

## LEGISLATION

A few changes in the Regulatory Power Act were made by the Legislature during the 1947 Session:

(1) Meetings of the Commission in relation to establishing hunting regulations were advanced from the month of June to April.

(2) The act itself was extended for another two-year period.

Two other measures of considerable importance were enacted, the Wildlife Conservation Act of 1947, and the Pacific Marine Fisheries Compact. The value of both these enactments will be realized for many years to come by the commission, the division, sportsmen and those connected with the commercial fishing industry.

To best illustrate the intention of the Wildlife Conservation Act and its widespread purposes, we quote the first section thereof:

"It is hereby declared that the preservation, protection and restoration of wildlife resources within the State of California is an inseparable part of providing adequate recreation for our people in the interest of public welfare; and it is declared to be the policy of the State to acquire and restore to the highest possible level, and maintain in a state of high productivity those areas that can be most successfully used to sustain wildlife and which will provide adequate and suitable recreation. To carry out the

aforesaid purposes, a single and coordinated program for the acquisition of lands and facilities suitable for recreational purposes and adaptable for conservation, propagation and utilization of fish and game resources of the State is hereby established."

With these laudable purposes, the Legislature created in the Department of Natural Resources, the Wildlife Conservation Board, consisting of three members: The President and Executive Officer of the Fish and Game Commission and the Director, Department of Finance. An advisory committee of three Senators and three Assemblymen was also established.

The powers of the board and certain rules of procedure were outlined, and a companion bill enacted to provide from the revenue of the Horse Racing Fund the sum of $3,000,000 per year for three years for the board to use in carrying out the purposes as expressed in the act.

Proposed projects were to be thoroughly investigated and appraised, and, upon approval by the board, assigned to the Fish and Game Commission, with necessary funds for acquisition and construction of facilities.

This "aid to wildlife" will permit the commission's regular revenue from license fees, fines, etc., to be used for the operation and maintenance of the many installations required by the tremendously increased number of hunters and anglers.

The Pacific Marine Fisheries Compact was enacted to enable the State of California to cooperate with the states of Oregon and Washington in the formation of a Pacific Marine Fisheries Commission.

The purposes of the "compact" are to promote the better utilization of fisheries which are of mutual concern, and to develop a joint program of protection and prevention of physical waste of such areas of the Pacific Ocean over which the above-named states have jurisdiction, and to prepare and present legislation to carry out the finding of the commission in the respective states.

The economic value of this agreement will result in continued operation of the commercial fishing industry and its allied industries for many years to come, as regulations for seasons, take, etc., will be based on the research findings and statistics of the coastal states.

# REPORT OF THE EXECUTIVE OFFICER

With the start of the new biennium, the Bureau of Game Farms was abolished, following the retirement of its Chief, August Bade. The supervision and management of the farm was assigned as a function of the Bureau of Game Conservation.

The plan of reorganization of the functions and activities of the various bureaus of the division, prepared during the previous biennium, has been effected, with such additional changes as developed, for greater efficiency in administration and management.

The following personnel changes are worthy of note:

Bureau of Patrol:

L. F. Chappell appointed Chief, May 10, 1948
A. A. Jordan appointed Assistant Chief, August 1, 1947
S. R. Gilloon appointed Assistant Chief, April 1, 1948
O. P. Brownlow retired, December 31, 1946
Walter Engelke retired October 31, 1947
Walter Emerick retired April 1, 1948
Walter R. Krukow, deceased, April 20, 1947

Bureau of Marine Fisheries:

Richard S. Croker appointed Chief, September 1, 1946
S. H. Dado, retired, June 30, 1948

Bureau of Fish Conservation:

Earl Leitritz, appointed Supervisor of Fish Hatcheries, October 16, 1947, vice A. E. Burghduff, retired, October 15, 1947

Bureau of Game Conservation:

Ben Glading appointed Assistant Chief, August 25, 1947, vice Gordon H. True, Jr., retired, August 1, 1946

## CONSERVATION EDUCATION

During the biennium, several of our silent motion pictures were reedited into shorter versions, and sounded. "More Trout for the Creel," showing a few typical fish hatcheries, methods of propagation and planting in lakes and streams became very popular and continues as a most interesting and educational project. Picturing and describing the construction and use of the watering devices, "More Quail for the Deserts" is a very fine film for instructional purposes. "Game Farms and Ringnecks" shows the production program of our game farms and the release of pheasants. "Sardines for Supper" well illustrates the commercial fishing, canning, and processing industries.

The sounding of our pictures enabled loaning of these films without the necessity of our personnel taking projection equipment, thus effecting considerable saving in travel expense, and at the same time providing greater distribution and use, by adult groups, and in school assemblies.

Films and projection equipment were supplied for the San Francisco, Sacramento and Los Angeles offices.

Showings by personnel of these offices and by loans approximated the following:

| | |
|---|---|
| Schools | 210 |
| Sportsmen's clubs | 135 |
| Service organizations | 175 |
| Other groups | 70 |
| | 590 |

Attendance at these showings and at meetings where our personnel were requested to speak on definite topics is estimated at close to 97,000 men, women and children.

Plans are under way for additional films, and revisions of some present subjects, in order to obtain greater use in school classes, and increasing the knowledge of California's wildlife resources and the division's activities in conservation, propagation and management.

## PUBLIC INFORMATION

Despite the personnel turnover, the public information section of the division was considerably improved. The need for a vigorous informational program was recognized, and the support of the various bureaus of the division was given in supplying data of interest to sportsmen and laymen.

The press release "Outdoor California" was expanded from a one-page affair to an average of five mimeographed pages per week with a mailing list of over 3,000 names. Selected radio stations and newspaper columnists were included in an effort to obtain wider dissemination of conservation news material. Many editors were supplied with stock photographs portraying hunting, fishing or conservation activities.

The *Service Bulletin*, a publication for our own personnel, was revived, and became a medium of useful information for the employees of this division.

This section participated in displays at the 1947 State Fair, and at sportsmen-sponsored shows in Oakland, San Francisco and Los Angeles.

Experiences gained during this past biennium clearly indicate the necessity for better relations between the commission, its personnel, and the license-buying public, in the presentation of information, educational or otherwise. This will establish the public's faith that the commission is only concerned in the welfare of the wildlife of California, that the hunters and anglers may have opportunities to obtain their fair share, and that the coming generations, too, may enjoy some of the privileges we now have.

## LIBRARY

The library, under the supervision of the executive officer, continued to carry out the division's policy of furnishing assistance to the field and office force in furtherance of their studies and problems connected with fish and game.

During the biennial period, the inventory included 4,036 bound volumes and 9,588 scientific pamphlets; all having been catalogued, they form a sizeable, valuable, bibliographical collection.

Many requests from sportsmen, schools, and the general public for free copies of division publications, and for reprints from *California Fish and Game* were received and processed. The lending section of the library has increased proportionately with the growth in number of employees.

## PUBLICATIONS

Eight issues of the quarterly magazine *California Fish and Game* were published during the biennium, with 5,000 copies being printed of each issue. A total of 542 pages were necessary for the 73 articles of scientific value, the many "news notes," reports, fiscal statements, indexes to volumes, and lists of personnel. Increased interest of hunters and fishermen in division activities, plus added enrollments in colleges have increased the demands for this worth-while periodical.

## FISCAL

Complete financial statements for the biennium will be found in the appendix of this report. However, the following graphic charts show in summary the receipts and disbursements for the two-year period.

Attention is called to the fact that these charts are made up in accordance with the internal structure of the division, and, that in regard to purpose of expenditure, there is considerable overlapping of functions. From the charts, it looks as though the Bureaus of Patrol and Licenses were "sponging" off the revenue of the other bureaus; whereas, if it were not for their activities there would be but *very* little revenue derived from sales of hunting and fishing licenses.

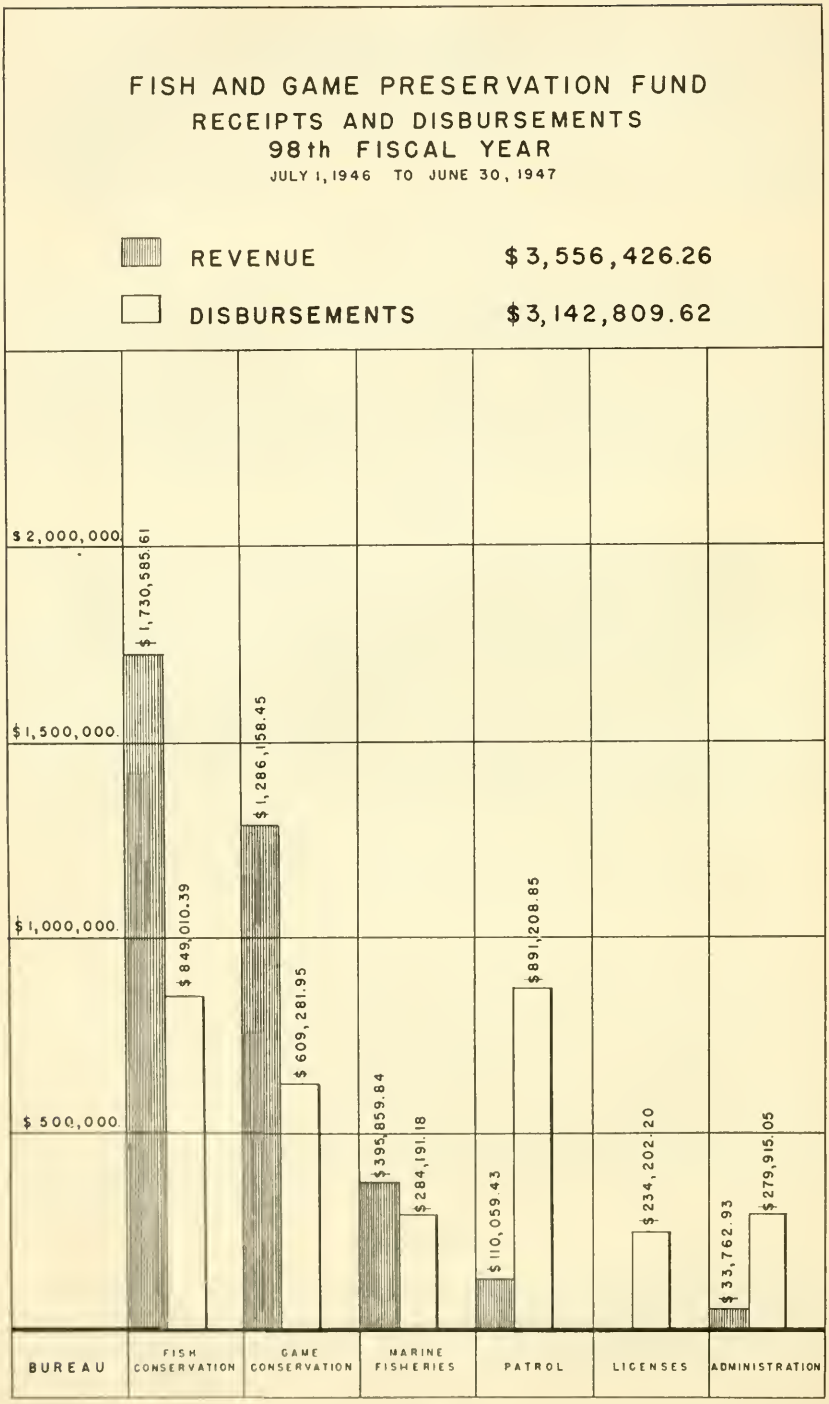

FISH AND GAME PRESERVATION FUND
RECEIPTS AND DISBURSEMENTS
98th FISCAL YEAR
JULY 1, 1946 TO JUNE 30, 1947
REVENUE $3,556,426.26
DISBURSEMENTS $3,142,809.62
$2,000,000.
$1,500,000.
$1,000,000.
$500,000.
$1,730,585.61
$849,010.39
$1,286,158.45
$609,281.95
$395,859.84
$284,191.18
$110,059.43
$891,208.85
$234,202.20
$33,762.93
$279,915.05
BUREAU
FISH CONSERVATION
GAME CONSERVATION
MARINE FISHERIES
PATROL
LICENSES
ADMINISTRATION

FIGURE 1

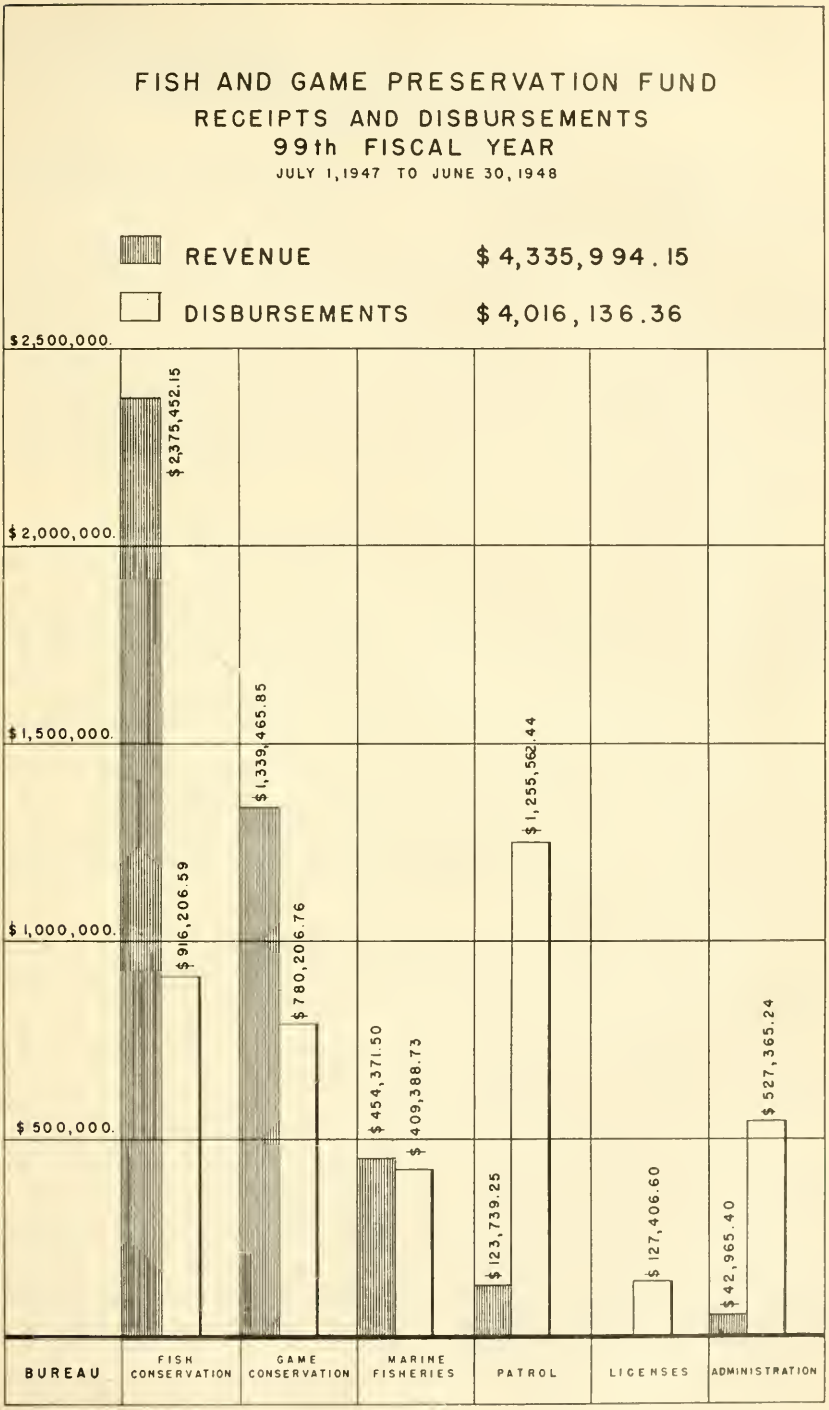

FISH AND GAME PRESERVATION FUND
RECEIPTS AND DISBURSEMENTS
99th FISCAL YEAR
JULY 1, 1947 TO JUNE 30, 1948
REVENUE $4,335,994.15
DISBURSEMENTS $4,016,136.36
$2,500,000.
$2,000,000.
$1,500,000.
$1,000,000.
$500,000.
$2,375,452.15
$916,206.59
$1,339,465.85
$780,206.76
$454,371.50
$409,388.73
$123,739.25
$1,255,562.44
$127,406.60
$42,965.40
$527,365.24
BUREAU
FISH CONSERVATION
GAME CONSERVATION
MARINE FISHERIES
PATROL
LICENSES
ADMINISTRATION

FIGURE 2

## BUREAU OF PATROL AND LAW ENFORCEMENT

E. L. Macaulay was appointed Executive Officer of the Fish and Game Commission on May 10, 1948, and the writer assumed the duties of Chief of Patrol at that time.

The total number of arrests, convictions and fines in the present biennium have increased tremendously over that of the previous one. Arrests totaled 11,331, or an average of more than 15 per day, for the two-year period. Fines totaled $476,367, or an average of more than $42 per case. This represents nearly 100 percent increase over the previous biennium. All fish and game enforcement agencies of the Country have experienced similar increases in violations of the conservation laws. In California, a part of this can be attributed to an unprecedented increase in population (estimated for 1949 to be over 10,000,000), and from a historical standpoint, an aftermath of war.

No one is naive enough to believe that there will ever be a time when fish and game laws will be observed by the entire public without rigid enforcement. It is axiomatic that the laws of the Legislature, and the regulations of the commission are no stronger than their enforcement. This feature of conservation calls for expensive equipment, and with the advent of the five-day week, increased personnel to accomplish results.

The patrol areas of the State consist of the following:

1. The coastal area: Del Norte County to and including Monterey County; headquarters, San Francisco.

2. Northern California area: The Counties of Modoc, Lassen, Siskiyou, Shasta, Trinity and Tehama; headquarters, Redding.

3. Sacramento area includes all the counties in the Sacramento Valley, and Sierra Nevada Mountains from Tehama, Lassen, and Shasta Counties, south to and including El Dorado and Sacramento Counties; headquarters, Sacramento.

4. The San Joaquin area includes counties in the San Joaquin Valley and Sierra Nevada Mountains, south of El Dorado and Sacramento Counties to and including Kern County, but excluding Mono County; headquarters, Fresno.

5. The Southern California area includes San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, San Bernardino, Inyo, and Mono Counties; headquarters, Los Angeles.

6. The marine area consists of the entire coast line from the Mexican border to the Oregon line, and the commercial fishing areas of the Sacramento, and the San Joaquin Rivers; headquarters, San Francisco.

Each of these areas is under the direct supervision of an assistant chief of patrol, and is further broken down into patrol captain districts. At the present time there are 16 captains and a total of 170 wardens and assistant wardens, as well as one warden-pilot. Thirty of the assistant wardens mentioned were placed on the pay roll on June 1, 1948, as a result of the five-day week requirement.

Two of the present patrol areas were created during the biennium just concluded; the Northern California area, and the San Joaquin

area. These were formerly a part of the Sacramento patrol district. Captain Jordan of Redding, and Captain Gilloon of Fresno, were promoted to fill the positions of assistant chief in these areas.

The following wardens were promoted to captains during the biennium:

| | |
|---|---|
| Jay Cox—Alturas | Walter Shannon—Los Angeles |
| Ellis Berry—Tulare | Lee Shea—Santa Rosa |
| Willard Greenwald—La Mesa | Howard Shebley—Independence |
| Leslie Lahr—Eureka | A. L. Stager—Redding |
| Wm. La Marr—Altaville | |

Following is the list of personnel retired during the biennium period:

| *Name* | *Date of retirement* |
|---|---|
| Warden Fred Starr | July 31, 1946 |
| Warden Earl Caldwell | October 31, 1946 |
| Captain O. P. Brownlow | December 31, 1946 |
| Warden E. H. Glidden | June 9, 1947 |
| Warden F. A. Bullard | June 30, 1947 |
| Captain Walter Engelke | June 30, 1947 |
| Warden N. C. Kunkel | December 31, 1947 |
| Warden Walter Emerick | March 31, 1948 |
| Assistant Chief H. C. Jackson | June 30, 1948 |
| Warden W. C. Malone | June 30, 1948 |

We are especially grieved to report the loss of Warden Walter Krukow who met his death in line of duty on April 2, 1947. He was shot near Redding by an irresponsible youth, whom he had reprimanded for a violation of the fishing laws. Warden K. Carl Lund was found dead from asphyxiation in a state car on June 14, 1948.

The wardens' school of instruction was inaugurated in this biennium; the first one being held at Wheeler's Hot Springs, Ventura County, in February and March, 1947, under the capable supervision and management of Assistant Chief of Patrol H. C. Jackson. Forty wardens and assistant wardens attended this school. The second and third schools were held at Asilomar, Monterey County, in January and June, 1948. A total of 73 attended these meetings. The results of these schools have proven most satisfactory, and will be continued. To the other bureaus of the division, attorneys, county and state agencies who contributed to the success of this program, the Bureau of Patrol extends sincere thanks.

The wardens reserve force now numbers 86, including the marine reserve patrol. These men have been unselfish with their time, in lending assistance to the regular patrol whenever requested. These groups are principally in Southern California, composed of sincere sportsmen, anxious to do their bit without regard to personal benefits in an effort to protect fish and game for all the people.

An effort has been made during this biennium to reequip the Marine Patrol. This branch suffered extreme depletion during the war. The following replacements, and additions have been made:

The patrol boat "Albacore" was purchased in March, 1948, and is being reconditioned for patrol work on the north coast. This hull was formerly a Coast Guard cutter, 83 feet in length. The gas engines have been removed, and it will now be powered with two 500 horsepower

FIGURE 3. Purchased in 1948 from Coast Guard surplus stocks, the speedy 83-foot M. V. "Albacore" is employed by the Bureau of Patrol in Pacific Ocean waters between Monterey and the Oregon state line. It is equipped with radar, radio-telephone, and other up-to-date marine equipment. Power is provided by twin 500 horsepower diesel engines. The second vessel to bear the name, the "Albacore's" home port is San Francisco

diesel engines. This vessel will have a complement of six men, and a cruising radius of 1,200 miles. It will be capable of remaining at sea for the longer period of time necessary in the patrol of ocean waters of the north coast. The bureau has been lacking in patrol of these waters for a number of years. This vessel will be in operation early in the fall of 1948.

Two 63-foot aircraft rescue vessels were purchased near the close of the biennium. These vessels will replace two of the 45-foot boats which have been in service since 1937, and which will be sold because of obsolescence. The fast 63-foot vessels are equipped with two 630-horsepower gas engines, radio and radar, and will be used principally in southern waters for policing closed areas. These boats have been named the "Bluefin" and the "Marlin."

The 26-foot twin engine patrol boat "Skipjack" was purchased in June, 1947, and is used for coast and harbor patrol on the south coast and Catalina Island.

Two small 23-foot Chris-Craft boats were purchased in June, 1947; one, the "Bass," was stationed at Millerton Lake and early this year transferred to the Sacramento River for patrol of that area; the other, the "Grunion," is stationed at San Pedro, and is used on pollution and other inshore patrol.

Considerable difficulty has been experienced in securing automotive equipment for field work, caused largely by the inability of the suppliers to make deliveries. Ten jeeps were purchased at the close of the fiscal year. Two were placed in charge of each assistant chief. Should this type of equipment prove satisfactory, additions will be requested in the next budget.

FIGURE 4. C-45 Beechcraft assigned to Bureau of Patrol and Law Enforcement (also used by other bureaus as required)

A Model C-45 Beechcraft twin engine airplane was purchased in April, 1948. This plane will be used by all bureaus to carry on aerial reconnaissance and observation. It will supplement the Fairchild single engine plane now in use.

The plan for the use of state radios has not been perfected at the time of this report. Considerable success has been achieved with them in the northern patrol area, particularly in Shasta, Siskiyou, Modoc and Lassen Counties. Sheriff's radios were installed, and maintained in most of the cars of wardens in the coastal area from Humboldt County to Monterey County.

The bureau wishes to extend its appreciation to the various courts, newspapers and periodicals throughout the State which have so generously supported the program of law enforcement. Five hundred dollar fines and numerous jail sentences are not unusual for violations of the Fish and Game Code.

It is a rule of the bureau that all reports of violations receive immediate attention. Our efforts will continue in cooperation with local authorities and conservationists in every way possible towards rendering fish and game law violations an expensive risk.

A recapitulation of the arrests, fines and seizures will be found in the appendix, on page 105.

# REPORT OF THE BUREAU OF MARINE FISHERIES

The responsibility for the conservation and administration of the ocean fisheries of California is in the hands of the Bureau of Marine Fisheries. The bureau conducts biological and statistical studies of the marine sport and commercial fisheries; and with the information thus gathered and analyzed, is able to make recommendations to the Fish and Game Commission and the Legislature for wise conservation measures.

In order to maintain an ever-expanding fishery which is exploiting an ever-shrinking resource, the bureau's research efforts have been redoubled, and our staff is constantly seeking the answers to the perplexing problems of changing abundance. With the return of many staff members, and the research vessel from war service, and with the addition of new research men, we are now able to carry on our program on something like the scale that the demands of the fishery require.

California's ocean commercial and sport fisheries still lead those of all the other states. While the sport fishery increased by leaps and bounds following wartime curtailment, the commercial fishery declined considerably in volume during the biennium. However, the value in dollars continued to rise.

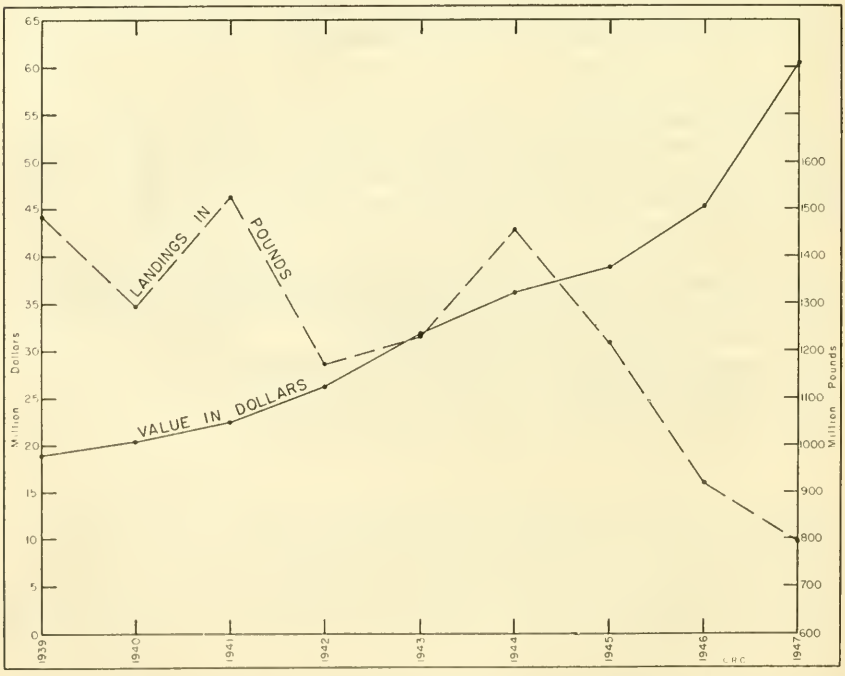



FIGURE 5. Value and poundage of California commercial fish catch, 1939-1947. Value represents amount paid to the fishermen at time of delivery. Note how values have continued to increase while catches have dropped

The total commercial catch dropped in 1946, and tumbled further in 1947 (see Figure 5). The decline was due almost entirely to the collapse of the sardine industry. With an expanded fleet fishing intensively, catches dropped because of lowered abundance of the sardines. The demand for this fish for canning was better than ever, and most of the fish was canned. Prices for oil and meal were low, and there was little inducement for the reduction industry, even if sardines had been available. By contrast, the tuna industry continued to expand, and catches reached record proportions. The mackerel fishery showed good gains, with the jack mackerel replacing the Pacific mackerel in a sensational rise. Anchovy and squid catches increased markedly as canners sought to augment slim sardine landings. The salmon fishery continued in a healthy condition, and catches of bottom fishes remained on a high level. (See Table 2.)

A general increase in the prices paid to the fishermen for all species of fish, plus the increase in landings of high-priced tuna, resulted in a continued rise in value of our fisheries. (See Figures 5 and 6.) Value records of $36,000,000 and $39,000,000 set in 1944 and 1945, and at the time deemed impressive, were left far behind as 1946 saw catches valued at $45,000,000 brought into California ports. This figure was in turn eclipsed by the tremendous valuation of $60,000,000 for 1947 catches. Of this amount, the yellowfin tuna alone accounted for $23,000,000. (See Table 2.)

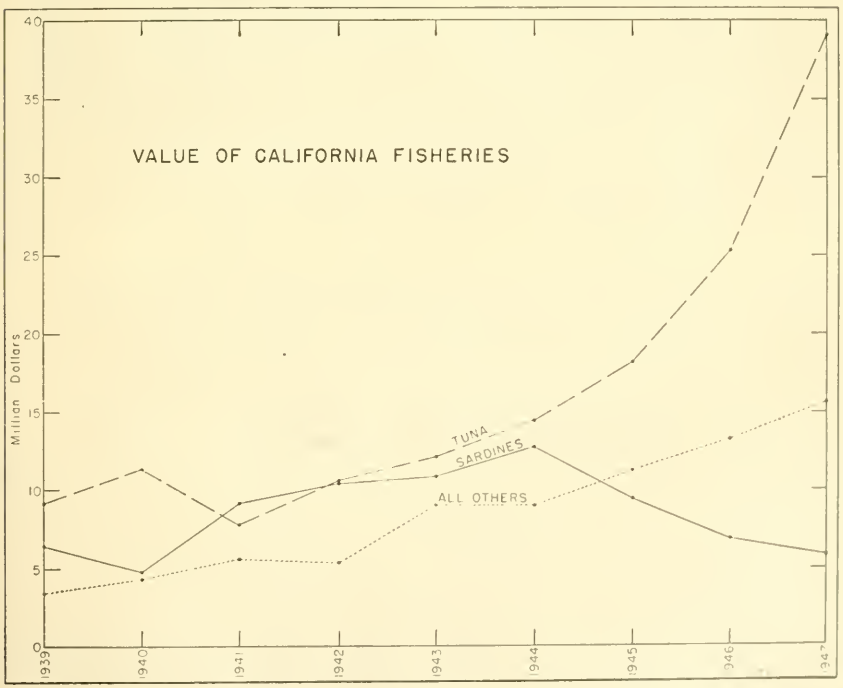



FIGURE 6. Value of California's two leading fisheries, compared to all others. Tuna includes albacore, yellowfin, bluefin, skipjack, and bonito. The great rise in total value shown in the chart on Figure 5 is accounted for in great measure by the tuna fishery. Because of increased prices, the decline in the value of the sardine fishery is not nearly so great as the drop in tonnage

Production of canned fish reached record proportions during the biennium, showing a considerable gain over the previous two years. The 10,000,000-case pack of 1947 was a notable figure, considering the light sardine catch. Production of fish meal and oil took a great drop because of the failure of the sardine fishery.

Accompanying the increase in value of the fish to the fishermen was a comparable increase in the value of the processed product. The sensational gain in wholesale value from $79,000,000 in 1945 to $132,000,000 in 1947 was due to the increase in the high-priced tuna pack and to the inflated prices that all canned fish are commanding. The fishing industry of California has truly become a multi-million dollar business.

The 1947 catch was made by 12,894 commercial fishermen, and was processed by 13,161 plant workers. The number of fishermen increased steadily from 10,871 in 1944-45 to 12,894 in 1947-48 (see Tables 3 and 4). This increase was accounted for entirely by United States born fishermen, as the number of foreign-born fishers remained constant. As a matter of fact, Norwegian-born fishermen have numbered exactly 454 for the last three years.

## SARDINE

The sardine fishery suffered a severe collapse during the biennium. The 1946-47 catch was approximately half that of the previous season which was the lowest on record since the expansion of the fishery. In spite of the industry's hopes that the slump was temporary, the 1947-48 season brought a further drop, to the insignificant figure of 115,000 tons (see Figure 7). The effect of this decline was catastrophic to fishermen, boat owners, plant owners, and cannery workers alike. In despera-

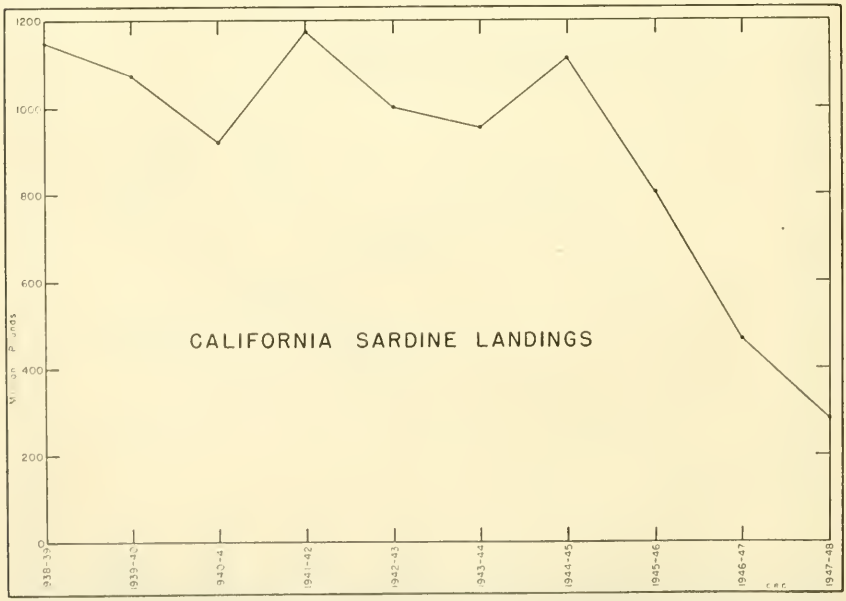



FIGURE 7. Tons of sardines landed at all California ports during the past 10 seasons. The total for 1938-39 includes deliveries to the floating plants. After this season the floaters ceased operations. The decline of the sardine fishery has been little short of catastrophic

tion, the industry turned to every available species of fish that could be canned, and record-breaking packs of jack mackerel, herring, anchovies, and squid were produced. Expanded exploitation of these species has constituted an additional threat to their future abundance.

During both seasons the fisheries at San Francisco and Monterey failed almost completely. Virtually the entire purse seine fleet deserted the fishless northern waters, and concentrated their activities in Southern California. As a consequence, landings were heavy at San Pedro in 1946-47, but even the tremendous fishing effort could not maintain the catch the following year. Trial shipments of sardines by truck were made from Southern California ports to Monterey in 1946-47. Considerable tonnages were trucked the following season, some as far as San Francisco. Most of the fish arrived in good condition for canning. Extremely high prices for canned fish made this expensive procedure possible, and kept the Monterey canneries from closing.

Practically all the fish taken during the last two seasons were used for canning. The high price of the raw fish, and low prices prevailing for oil and meal, coupled with the scarcity of fish, made the operation of reduction plants unprofitable. Production of sardine meal dropped from 31,000 tons in 1946-47 to 13,500 tons in 1947-48. At the same time, sardine oil production declined from 4,100,000 gallons to 1,700,000.

Because of the major crisis experienced by the sardine fishery, much of the effort of the research staff was directed toward explaining the reasons for the failure to the industry, and toward finding ways in which to rehabilitate the sardine population and prevent further collapse.

Results of the investigations extending over 30 years were summarized and distributed in mimeograph form. These studies showed that the sardine fishery could not continue to expand, and that peak production had been reached by 1937. Stated briefly, the reasons for decline are a drop in abundance brought about by extremely heavy fishing, accompanied by a succession of many seasons of very poor spawning. Although this information had been published several years earlier, and had been repeated regularly, most of the industry was not prepared for the disaster.

Leaders in the industry realized, however, that if the fishery were to be rehabilitated, expanded research beyond the facilities of the Bureau of Marine Fisheries would be necessary. Through their efforts, additional funds were made available to other agencies, by the Legislature, and much time and effort has been expended in coordinating the work of the bureau with that of The Scripps Institution of Oceanography, the California Academy of Sciences and the United States Fish and Wildlife Service. By the end of the biennium, a well-organized program had been set up under the guidance of the newly-authorized Marine Research Committee which is composed of members of the industry as well as of the Fish and Game Commission. The expanded work will concentrate on the collection of physical, chemical, and biological data at sea, and the subsequent analysis of this oceanographic information. In addition to the studies to be carried out by these agencies, the Bureau of Marine Fisheries acquired a second research vessel which will spend the major part of her time on this oceanographic work.

Routine sardine investigations were continued throughout the biennium. These comprise analyses of the size and age composition of the catch, and a measure of the average catch of the fishing fleet. For all of California, the monthly catch of an average vessel in 1946-47 was 50 percent below that of the previous season, and in 1947-48 again dropped almost 50 percent below 1946-47. The greatest decline occurred off San Francisco where fish were so scarce the fleet could no longer operate. At Monterey the decline was almost 80 percent in 1946-47, and in 1947-48 not enough boats were fishing to permit calculations of an average. Fishing in Southern California was relatively successful, but there also the average monthly catch in 1946-47 was only 65 percent of the previous season, and in 1947-48 dropped to 45 percent.

Not only did the tonnage landed by the fishermen decline, but the larger fish became less and less abundant on the fishing grounds. This was a continuation of a trend which has been going on for some years. In the early history of the fishery, sardines as old as 15 years were frequently taken, and the industry depended largely on fish of four to 10 years. In the past two seasons fish of five years and older comprised only about 5 percent of the total, and over 65 percent were one and two year-olds. The results of the age composition studies carried on in cooperation with the U. S. Fish and Wildlife Service have been summarized and published in Fish Bulletin 69.

The M. V. "N. B. Scofield" made one trip into Mexican waters in March and April of 1948 to check reports that sardines were abundant south of the usual fishing grounds. Waters were surveyed as far south as San Domingo Point. No great abundance of fish was found north of Point San Eugenio. Former studies and tagging experiments have indicated that sardines from these northern Mexican waters mingle with the California population. A greater abundance of sardines was observed southward between Point San Eugenio and San Domingo Point. Counts of the vertebrae of fish collected in this area confirm former studies that this more southern sardine population makes little if any contribution to the California fishery.

Realizing that some sort of regulation would be necessary if the sardine fishery were ever to recover, the industry chose a Sardine Industry Advisory Committee to work with the bureau and advise the Fish and Game Commission. Two objectives were set up: A temporary program of regulation for the 1948-49 season within the framework of existing legislation; and a long-range legislative program of conservation. Real progress was made in reconciling divergent ideas, and the temporary program embodying a size limit and a limitation in the number of fishing days was presented to the commission and adopted immediately following the close of the biennium. Work on the legislative program is continuing, with most of the industry now aware of the uncertain future, and realizing that only by taking drastic measures can the fishery survive.

In view of the expanded fisheries for anchovies and herring, the sardine staff extended their work to include the collection of length measurements and scale samples from these two species. This constitutes a start toward life-history and abundance studies.

## TUNA

The period covered by this report was one of reconversion and expansion in the tuna industry. With the decline in the sardine fishery, and a tremendously expanded market for canned tuna, the attention of the industry at the close of the war appeared to concentrate upon the possibilities for an enlarged tuna fishery. The increase in the price of tuna, and the success of the residual fleet of tuna boats attracted new and additional capital into the fishery. A large fleet of new vessels was built or under construction, existing canning plants were expanded, and several new ones were organized. In 1941 there were 17 plants that packed tuna in California. By June, 1948, the number had increased to 23. In

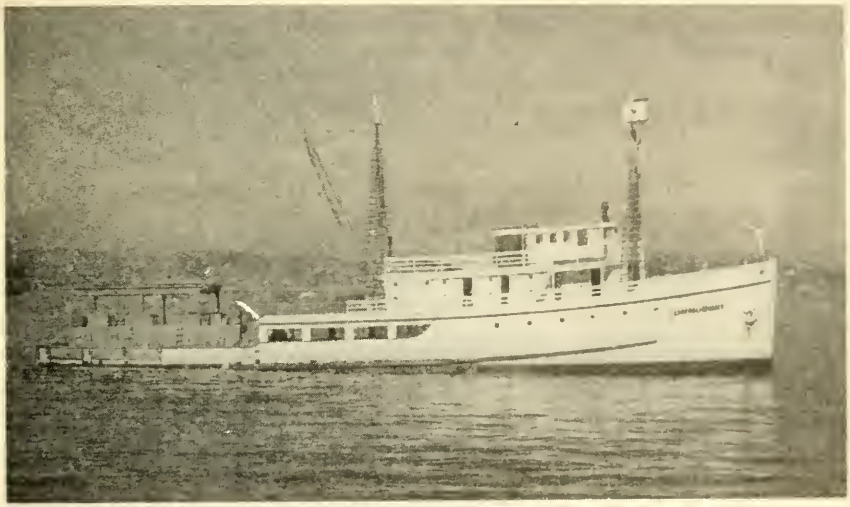


FIGURE 8. Tuna bait boat returning to San Diego with a load of fish.
*Photograph courtesy of "Tuna Fisherman"*

1941 a relatively stable fleet of 96 tuna boats, aggregating about 19,333 gross tons, fished with live bait throughout the year or a greater part of it. By the end of 1946 (latest figures available at writing), this number had increased to 136 vessels, aggregating 27,526 gross tons; and the totals have increased steadily as the regular tuna boats, relinquished by the Navy, have been reconverted to commercial fishing, and new clippers have been built. Moreover, the failure of the sardine fishery in this biennium has forced a large number of purse-seiners to seek other employment. The majority of these have turned to tuna, with the consequence that this has materially increased the total tonnage of vessels engaged in the tuna fishery.

The keen competition for tuna between vessels and between fleets has resulted in a number of important developments. For the first time the supremacy of the California industry has been challenged by the Pacific Northwest. Originally interested only in the local seasonal run of albacore in the vicinity of the Columbia River, the plants there which

were constructed or modified to pack albacore are now aggressively reaching out for their share of yellowfin tuna, and skipjack. In 1947 one company sent its mother-ship into Costa Rican waters, and in the spring and summer of 1947 purchased on the grounds for delivery to Astoria a full load of yellowfin and skipjack. In the winter of 1948 a second northern company had two mother-ships on the grounds purchasing fish from our fleet for delivery to the Columbia River.

In self-defense, a number of California packers have followed this lead; and by the summer of 1948 a number of tenders, or mother-ships, were either in actual operation, or in process of conversion. The mother-ships have apparently come to stay; and this marks an important development initiated in this period.

The purse seiners, which in earlier years fished for yellowfin and skipjack only in Lower California waters in that season when fish were there available, have now by force of circumstances already mentioned, extended their operations as far as Costa Rica. This has necessitated enlarged refrigeration plants on the vessels, and some modification in equipment. The extended range in operations has also resulted in the construction—or conversion—of a number of large vessels for purse-seining. For the first time the largest purse seiners are now comparable in size and tonnage with the large live-bait tuna boats.

FIGURE 9. A California purse seine boat leaving port. This type of vessel, of which there are over 200 in California, fishes for sardines, tuna, and mackerel principally. (*Photograph by Vernon M. Haden, San Pedro*)

This expansion in purse seine operations has resulted in considerable friction between the two basic types of gear; and their respective

associations are now exerting considerable pressure upon Central American governments to relax or restrict the fishing regulations in their favor.

Reflecting the competition between boats, and the increasing difficulty of securing full fares, a few vessels are now carrying scout planes. This is still in an experimental phase, and the results are somewhat conflicting. Although the planes have definitely increased the scouting range of the individual vessels, and have materially aided in locating bait, at least two boats have tried and abandoned the carrying of a plane. At least one boat has continued to operate its plane over a number of trips, and is thoroughly satisfied with the results. Others are noncommittal. In all probability, the planes will come into limited use.

During this period of expansion, the landings of yellowfin tuna broke all records with receipts of 150,000,000 pounds in 1947 (see Figure 10, and Table 5). Skipjack catches were well above average, but still slightly below the peak reached in 1940. The bluefin fishery, conducted in local and northern Mexican waters, continued at a level slightly

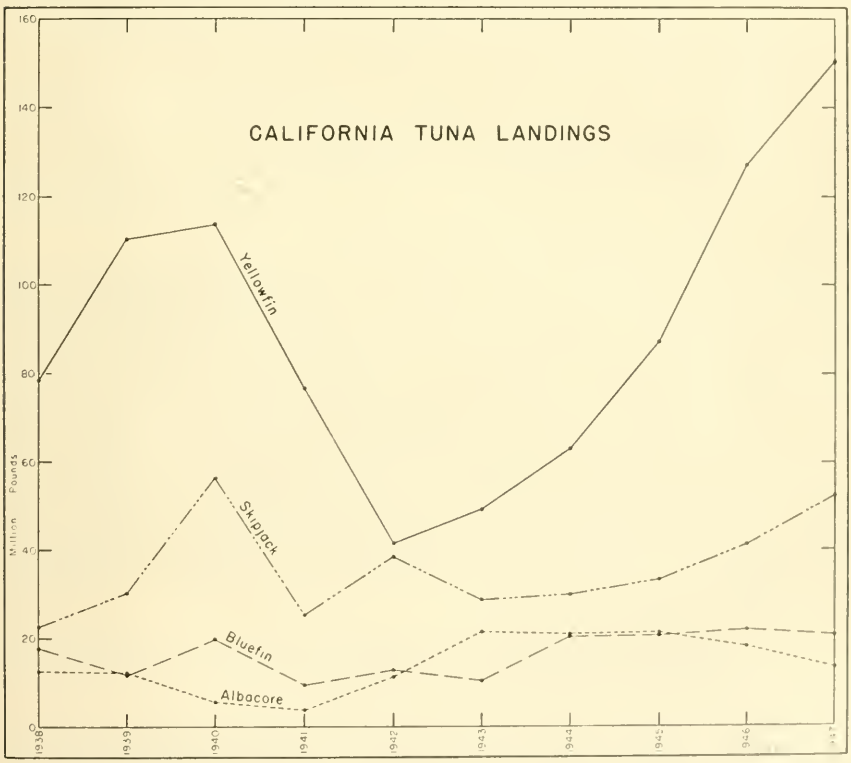



FIGURE 10. California landings of yellowfin, skipjack, albacore, and bluefin tuna, 1938-1947. Catches made by California boats and shipments from Oregon, Washington, and Latin America are included. Shipments from Japan are excluded. The tuna fishery has recovered from the slump caused by wartime restrictions and diversion of vessels to military service. The yellowfin tuna is now the most valuable species taken by the California fishing industry

above average. During 1946 and 1947 albacore slumped somewhat below the preceding three seasons. The fifth species of tuna-like fish, bonito,

underwent an exceptional increase to parallel the expansion in purse seine operations. Bonito landings increased from less than 1,000,000 pounds in 1944 to over 13,000,000 in 1947 (see Table 5).

The picture outlined above intimates that the tuna fishery faces a period of intensive exploitation. The future of the local industry depends entirely upon the size of the available stocks of tuna. If these stocks are extensive and relatively untapped, then a healthy expansion is possible. If, on the contrary, the stocks are limited in extent, and already heavily fished, then further expansion is not warranted, and may precipitate hardship and even disaster.

The staff of the bureau foresaw this crisis; and the entire investigative program was originally designed to answer this major question. Unfortunately, the war brought the tuna investigation to a standstill, and it was not resumed until the summer of 1946.

Four species contribute to the pack of "tuna." Of these, the bluefin tuna and the albacore are temperate and seasonal fisheries. Because they are seasonal, the catch of either species is determined by the extent to which they enter our fishing area, their abundance at that season, and the length of time they remain available. Over an 11-year period, the combined catch of these two species has averaged less than 15 percent of the total take of tuna. The remaining 85 percent has been supplied by the other two species, namely, the sub-tropical and tropical yellowfin tuna and skipjack. On the average the yellowfin supplies about 62 percent and the skipjack 23 percent of the total catch of tuna. Because of this fact, the laboratory investigations concern primarily the yellowfin and skipjack, with the emphasis upon the former.

In order to determine the potential catch of yellowfin tuna, it is necessary to know the extent of the stock supplying that catch. The work interrupted by the war has been resumed, and it has been shown tentatively in this biennium that the stock of yellowfin exploited by our fleet is confined to the eastern Pacific, and is not replenished from the Central Pacific Basin. Moreover, there are strong suggestions in as yet uncompleted work that the catch per boat has already passed its peak. The indications are, therefore, that the stock of yellowfin now exploited by our fleet will not support indefinitely any appreciable further expansion. The main emphasis of the entire tuna investigation is, therefore, concentrating upon an attempt to substantiate these indications, and determine definitely at what level the yellowfin fishery should be stabilized. If the pack of tuna is to be substantially and permanently increased, it must be at the expense of either:

(1) A distinct and more distant stock of yellowfin and skipjack, or
(2) The bluefin and albacore populations.

Before the latter alternative can be accomplished, it will obviously be necessary to locate these two species in those seasons when they are not now available in our fishing areas. So the secondary and minor phase of the tuna investigation consists now of exploratory work for bluefin and albacore, and a determination of the extent of their populations. In order to investigate vertical as well as horizontal extent, a set of drift gill nets of varying mesh was ordered and delivered at the close of this biennium; and the exploratory work has since begun.

## MACKEREL

In an effort to offset the failure of the sardine fishery, the purse seine fleet intensified its effort on mackerel. Although the scoop boat fishery for Pacific mackerel was generally unsuccessful in 1947, the operations of the seiners maintained the catch of this species at a fair level. However, indications are that the Pacific mackerel fishery is in poor shape. During the 1947-48 season much of the catch consisted of fish spawned in the spring of 1947.

The feature of the mackerel fishery was the tremendous increase in the catch of jack mackerel (horse mackerel). The 1946 landings of 15,000,000 pounds were well above average, but 1947 catches reached the unprecedented figure of 129,000,000 pounds (see Figure 11). Some of this catch was made in Central California, but the bulk of it resulted from the concentration of purse seiners in Southern California. In actual practice, the fleet fished for jack mackerel, sardines, and Pacific mackerel indiscriminately, taking whichever they could find. In fact, the schools were usually mixed, many hauls including all three species.

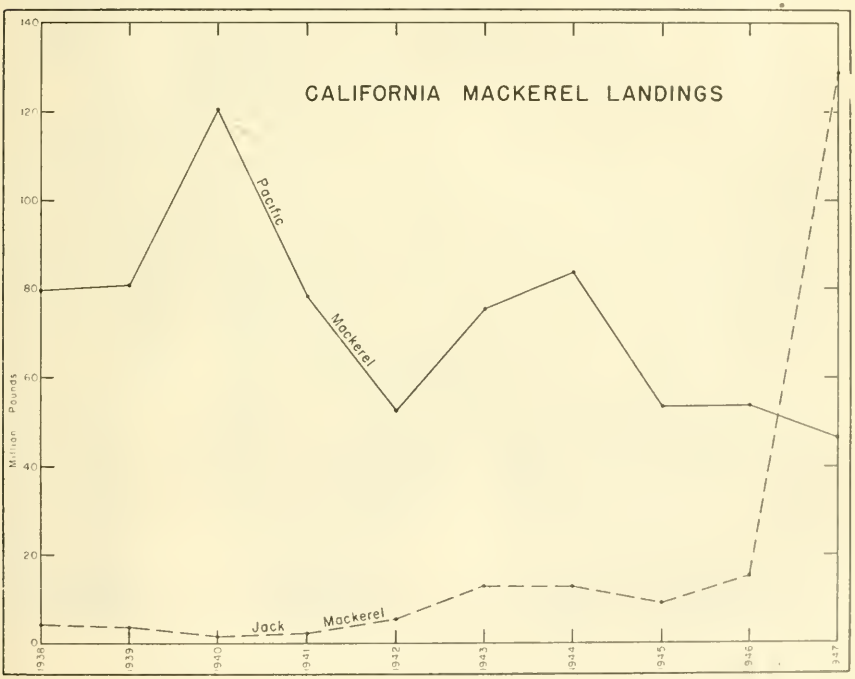



FIGURE 11. California landings of Pacific mackerel and jack mackerel, from 1938 through 1947. While the catches of Pacific mackerel have declined during the last several years, the once unimportant jack mackerel has achieved a leading position among California fisheries

Considerable quantities of both species of mackerel were shipped from the south to Monterey for canning during the 1947-48 season.

Young jack mackerel were very numerous, and the catches contained a high proportion of fish hatched only a few months previously. In order to afford some protection to these baby fish, as well as to young

Pacific mackerel and sardines, the commission set minimum size limits for all three species, effective in December, 1947.

During the biennium our research work on Pacific mackerel centered on studies interrupted by the war, and on routine sampling of the commercial catch at Los Angeles Harbor and at Newport Beach. The sampling program included both measurement of fish, and the collection of otoliths (bony ear structures) for use in age determination. Age studies progressed satisfactorily. Otoliths collected were read as was part of the backlog accumulated during the war. Results of the tagging and racial studies were analyzed and compiled in manuscript form. In both cases, the field work was done before the war. These studies indicated that the Southern California fishery draws to some extent on the mackerel population from as far south as central Lower California, but that fish from southern Lower California and the Gulf of California in all probability contribute little or nothing to the fishery. Tag returns demonstrated a free movement of fish between northern Lower California, Southern California, and Central California. Toward the close of the biennium work was started on an analysis of scoop boat catches to cover the years since 1939.

The great increase in importance of the jack mackerel lead to the establishment of a limited study of this species in 1947. The official name of the fish was changed from "horse mackerel" in the summer of 1947 because the old name proved a handicap in disposing of the increased pack. Before making the change, each processor was asked to show his preference for one of several acceptable substitute names. The consensus favored jack mackerel, and it was given official sanction.

Studies in progress at the close of the biennium included sampling of the commercial catch, age determinations, and a population study. Scales of jack mackerel did not prove satisfactory in age work, so otoliths (collected as part of the sampling program) are being used with apparent success.

## SALMON

The salmon resource was first developed as a commercial fishery under the Mexican Government, and before that time had been important in the food economy of many Indian tribes. This fishery is today the most important in Northern California; and in the light of the discoveries of the last two years, it must be recognized that its latent value has not yet been realized.

The 1946 catch of 13,639,000 pounds slightly exceeded that of 1945, and was the largest of which there is a reliable record. The following year, 1947, saw the production of 11,428,000 pounds, a catch that is among largest of which we know (see Figure 13).

The bureau's salmon tagging program of the past biennium has given for the first time two independent measures of the total run into the Sacramento-San Joaquin River system. These measurements indicate that the run of king salmon is far larger than had been supposed. They also indicate that the catch-to-run ratio is smaller than for any other major stream for which records have been published. These figures, when compared with those of the runs in other rivers, indicate that the potential values have been but partially developed.

FIGURE 12. Tagging a salmon. One man holds the fish in the V-shaped padded trough. The other applies a pair of tags. The tags are plastic discs, held in place by a pin or wire which passes through the flesh at the base of the dorsal fin. Tagging at sea, in the delta region, and in the streams gives measures of the sizes of the runs and the importance of the various rivers, movements in the ocean, and the time that runs bound for different streams pass through the fishing grounds. (*Photograph by D. H. Fry, Jr., Stanislaus River near Oakdale, November, 1947*)

In the last two years every stream of the Sacramento-San Joaquin Valleys which is without a barrier to the migration of the adults or a serious hazard to the life of the young salmon has had runs that crowded the spawning areas.

The future of this fishery is threatened by a reckless water program which, however, can be turned to the advantage of the salmon without taking water from any of the other benefits such as irrigation, flood control, power development, and salinity control. The water plan for the Sacramento-San Joaquin Valley has so far failed to recognize the fact that the flow of water required either for the control of salinity to

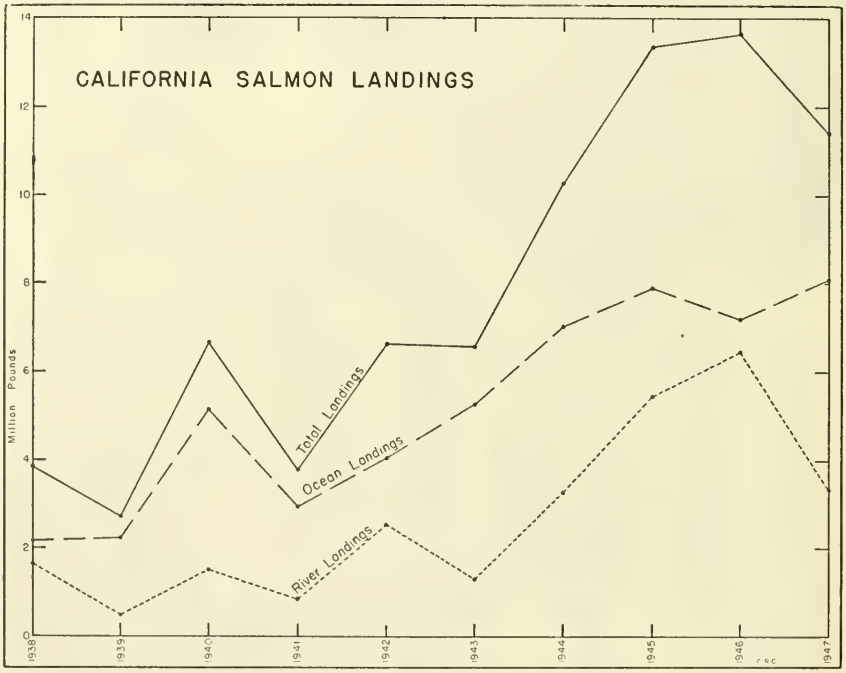



FIGURE 13. Commercial landings of salmon in California, 1938-1947. River catches, made in the lower reaches of the Sacramento-San Joaquin Rivers, consist of king salmon, exclusively. The ocean fishery, conducted from the Oregon line south to Monterey Bay, takes king salmon principally, but some silver salmon is also included in the catch

protect the rich lowlands, or for irrigation use below the elevation of the spawning areas is more than enough to provide adequate water for the salmon if it were properly distributed among the salmon rivers. That the water to control salinity is being taken from one or two rivers only instead of being shared among all of them is a serious flaw in the water plan that must be corrected if the fishery is not to suffer.

The spawning areas have been limited in size by high dams and the reduced flow in their streams, but they may be enlarged and improved where the rivers run through rockpiles of dredge tailings by making of them natural hatcheries in artificial channels which would make for a more efficient use of the available water.

The king salmon resource can be increased by erecting suitable fish ladders over those low dams which now prevent the access of the salmon to the spawning areas above, by cleaning up the pollution spots that stop the migrations of both the adults and the young, and by screening the diversions that trap and kill young on their way to the sea.

During the biennium, considerable progress has been made in the construction of fishways and screens in the Central Valley, but much remains to be done. We have developed a screen and ladder unit which works in close cooperation with the Division of Architecture.

The most notable achievement of the past several years was construction of a new fishway at Woodbridge Dam on the Mokelumne River. This stream has been suffering from the effects of a serious fish block at the dam. The old ladder was too small and too steep, was poorly located, and could not be reached by the fish during periods of low flows. When the flashboards were removed from the dam, the old fish ladder was totally inoperative, and at low flows the dam was impassable. Because of this situation, the salmon run is badly depleted. In early 1948 the new fishway was completed (see Figure 14). This ladder has two branches, one for use when the flashboards are in place, the other for when the boards are out. The structure was designed and the work supervised by the Department of Public Works, Division of Architecture. Their engineers can well be proud of the result. The fall of 1948 will be the first chance salmon will have to use the new ladder. Rehabilitation of the run can be expected in the next few years.

In late 1946 a fishway was completed over Clough Dam on Mill Creek. This ladder has since functioned well, and should result in benefit to the salmon and steelhead runs in this important tributary of the Sacramento River.

Preliminary plans have been drawn for critical fish ladders for Daguerre Point Dam on the Yuba River, and Sutter-Butte Dam on the Feather River. Early construction of these fishways is of vital importance. As the biennium ended, work was about to start on a series of small fishways over several gravel dams on the Merced River.

A large fish screen on Deer Creek was completely rebuilt, and a by-pass was constructed. Work is about to start on the rehabilitation of other screens and construction of by-passes on this stream and Mill Creek.

Because it may be possible to substitute electric fish screens for mechanical screens, and thus effect a great reduction in cost, we have continued our experiments with these devices. In theory, electric screens divert the migrating young salmon away from canal headings by shocking them with a harmless but painful discharge of electricity. To date the experiments have been disappointing. Some extensive changes in the electrode system gave some promise when tried on a small scale, but failed when applied to an entire screen. One difficulty has to do with getting the young salmon far enough from the canal so that the current of the river will take them on their way down the channel. Because most of the downstream migration takes place at night, and because young salmon are attracted by light, it was decided to erect a series of moving lights to attract the fish as they approached the screen. The lights would then lead them downstream to a place of safety. The device, tried on a large screen, has given definite promise; but biological, mechanical, and electrical

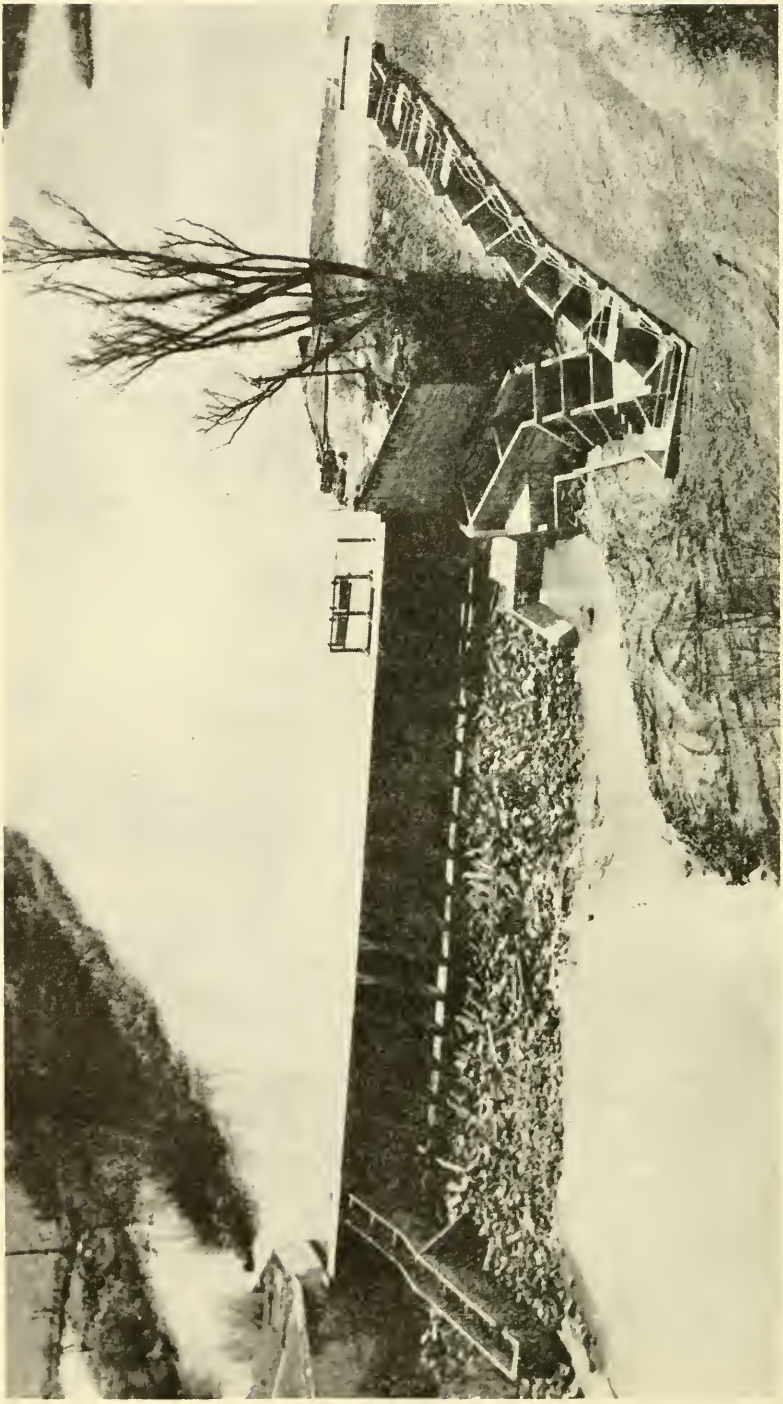


FIGURE 14. Woodbridge Dam on the Mokelumne River near Lodi. The new fishway, completed in February, 1948, is shown at the right. When the flashboards are in place and the lake is high, the salmon ascend the higher ladder at the extreme right. The alternate route which doubles back to the base of the dam abutment is used when the boards are removed. The old ladder, which was virtually useless, appears at the left. *Photograph by D. H. Fry, Jr.*

problems remain to be solved before it can be considered a complete success.

The most gratifying trend in connection with the fight against pollution is the growing awareness on the part of the public that the State cannot afford to let its streams become open sewers. Only with the support of aroused public opinion can the evils of pollution be corrected. Because of this attitude, offending industries and municipalities are now taking steps to clean up our waters.

Every year since 1944 the early part of the fall salmon run in the Tuolumne River has been blocked by pollution from the City of Modesto, and various industries in and near Modesto. In 1947 the situation was so bad and so little progress had been made that at the request of the Division of Fish and Game the Attorney General brought suit against the city and the industries. As in 1944, 1945, and 1946, the temporary expedient used was to release water from Don Pedro Dam to dilute the pollution to the point where salmon could live and proceed upstream. The court granted a delay in reaching a permanent solution. The city has been making a sincere effort to finish an adequate treatment plant before the fall run of 1948, but it seems probable that the plant will not be ready for the first part of the season, and that a release of water will be needed in 1948.

Pollution at Riverbank on the Stanislaus River caught us off guard, and killed the early part of the fall run in 1947. Because better use was made of the inadequate disposal system at Riverbank, the remainder of the season passed with no further trouble. By rejuvenating this system, the city and industries will probably be able to get through the fall of 1948, but an entirely new series of disposal beds will have to be put in service in the near future.

During the biennium, the salmon runs were satisfactory in all the major spawning streams of the Central Valley except the Mokelumne and San Joaquin Rivers. For example, the combined spring and fall runs of 1946 in the American River were estimated by tagging at 39,000 fish, of which 1,700 passed Folsom Dam. The U. S. Fish and Wildlife Service counted 57,000 salmon in the Tuolumne River in 1946, and estimate that in addition about 4,000 fish jumped the dam and were not counted. The calculated run in the Stanislaus River in 1947 was 13,000 fish. The Mokelumne River run has dwindled because of an inadequate fishway, but this condition has been corrected, as reported above.

The situation on the San Joaquin River could not be worse than it is. Inadequate water releases from Friant Dam have resulted in near extinction of the salmon run. The winter of 1946-47 was relatively dry, and the U. S. Bureau of Reclamation felt that it could allot no more than 15,000 acre-feet of water for the spring run. This water was released in such manner as to be of maximum benefit, but was still so inadequate as to be disastrous. Flows of 100 to 130 second-feet are inadequate during hot weather. Only 6,000 salmon were counted past Mendota Dam in 1947, compared to 56,000 in 1945, and 30,000 in 1946.

The winter of 1947-48 started as one of the driest on record. The U. S. Bureau of Reclamation announced that no water whatsoever could be spared for salmon; and in spite of all our efforts, as well as those of sportsmen's groups, the fishing industry, and congressmen to obtain water, the river below Dos Palos remained dry during the time of the 1948 run. As

the only recourse available, the Bureau of Marine Fisheries operated a salvage plan which called for construction of a fish trap, hauling the salmon overland, and releasing them in a canal whence they could make their way to the spawning areas. Tank trucks were furnished by the Bureau of Reclamation. The trap was located at the mouth of the Merced River. The only fish to reach the spawning beds on the San Joaquin were the 1,955 that were transported by truck. Heavy rains in April and May caused the Merced River to flood, and on May 28 the trap was lifted to allow all the fish to ascend this stream. Previously, 163 salmon had been trucked up the Merced, as these floods were not anticipated. No water was released in the San Joaquin, and those fish that did not ascend the Merced were lost in the warm backwaters of the San Joaquin. At the same time most of the young downstream migrants also perished for want of water.

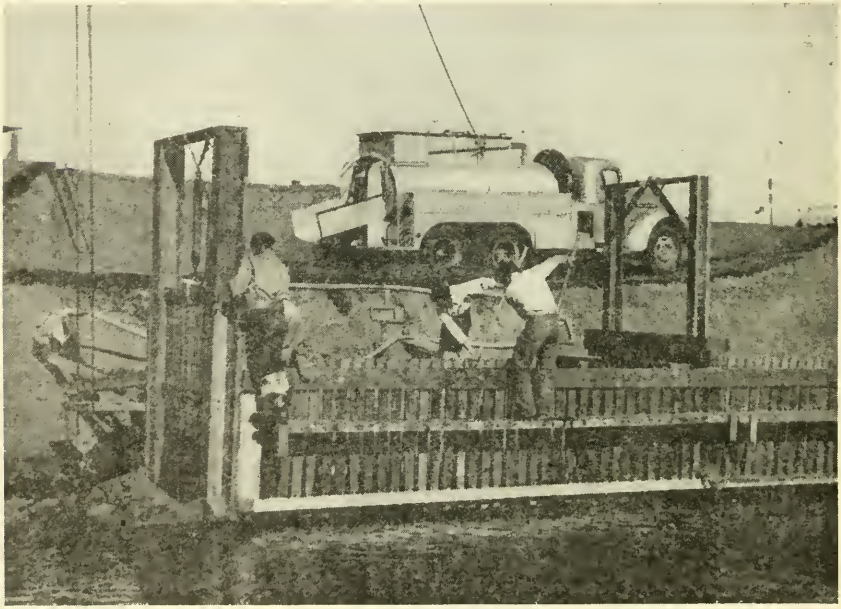


FIGURE 15. Because the middle reaches of the San Joaquin River were dry during the spring salmon run of 1948, it was necessary to trap the fish in the lower river and transport them overland to a canal whence they could reach the spawning beds. Two men are using a short net to herd the salmon out of the trap and into the bucket, which is nearly submerged at the left. By means of a derrick, the bucket of fish is transferred to the tank truck in the background. *Photograph by D. H. Fry, Jr., Hills Ferry, May, 1948*

## BOTTOM FISHERY

The trawl fishery for sole, sand dabs, flounders, and other bottom fish is one of the oldest commercial fisheries in the State. Prior to 1940 most of the vessels engaged in dragging were owned and operated by the producing companies. Double dragging (paranzella) necessitated the operation of two large vessels to drag the net along the bottom of the ocean. Inasmuch as the initial investment of each vessel was great, and two vessels were required to perform one fishing operation, this

method of fishing was logically financed and directed by the fish companies. At this time there were less than 20 vessels engaged in the fishery.

With the advent of World War II the loss of several vessels to the armed services gave impetus to a change to otter trawl gear. Otter trawl fishing is carried on by one vessel. With an unlimited market supplied by the military, the use of otter trawl gear spread through the fishery. There were no paranzella (double drag) operations during this biennium. The expansion in otter trawl boats continued until over 80 vessels are now engaged in this occupation. Development of dragging techniques has enabled some trawlers to extend their operations from 100 fathoms to as deep as 230 fathoms. This extension in range has opened new grounds to the fleet, and has resulted in heavy catches in this new area. Development of new processing methods in handling, filleting, and freezing has enabled the companies to keep abreast with the increasing catches. However, all is not well with the industry. Individual boat catches have shown a continuous decline from 1940 onward.

Other factors not apparent on cursory examination of the statistical data make this condition more ominous than appears. Nearly all the otter trawl boats now engaged in the fishery possess sonic depth finders. These devices make it possible to return to the same depth and follow schools of fish in those depths that they are most abundant. The radio telephone has also added to the increased efficiency of the fleet. Formerly, considerable time had to be spent prospecting for schools of fish. Now the information gleaned from the radio telephone has reduced this scouting to a minimum.

The development of fillet lines, similar in mechanization to canning lines, enabled the fishery to take other species of fish in great quantity that were formerly unutilized. The rockfish trawl fishery was developed to such an extent that loads of 80,000 pounds per trip were possible.

Even with the increased efficiency resulting from the use of the electronic devices, and the production and utilization of abundant new species such as rockfish and dogfish, the catch per unit of effort decreased. The average catch per drag has fallen from about 2,000 pounds prior to 1940 to slightly less than 1,100 pounds in 1947—a decrease of 45 percent. This decline ties in with the general loss of control over the fishing operations by the companies.

Prior to 1940 the companies maintained a voluntary 5-inch minimum size on their trawl nets. When the fishery shifted to independent operation, the voluntary agreement no longer prevailed, and the size of gear decreased to as small as three and one-half inches. Consequently, many millions of small, unsaleable fish have been killed needlessly; and as a result, the bottom fish populations have suffered a loss of abundance.

During the past two years landings of sole have increased markedly (see Figure 16, and Table 6). This increase, most of which took place at Eureka and Fort Bragg, was due to the increased fishing intensity, and to operations in deeper water. Rockfish catches, which had increased in a phenomenal manner during the war, suffered a sharp decline. This was due in some measure to a shrinkage in markets following the curtailment of military purchases, but signs of scarcity of fish are apparent on some of the banks.

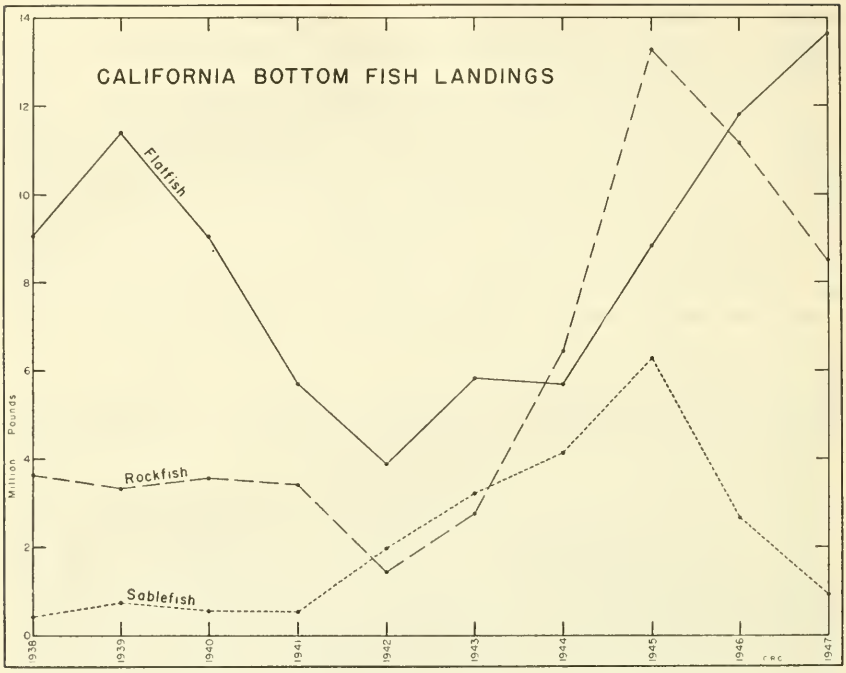



FIGURE 16. California landings of flatfish, rockfish, and sablefish, 1938-1947. Flatfish includes all species except halibut; i.e., various species of sole, sand dabs, starry flounder, and turbot. The flatfish have once again become the most important factor in the trawl fishery, having regained the lead held briefly by rockfish. The decline in the sablefish catch has caused much concern, as this valuable species has been subjected to too intensive fishing

The sablefish (black cod) fishery underwent a serious decline (see Figure 16). This fish, valuable for smoking, filleting, and vitamin oil, has been the object of heavy fishing effort, and has become badly depleted. Concern for the future, expressed by fishermen and by the Pacific Marine Fisheries Commission, has resulted in our commencing an investigation for obtaining the facts required to ensure a sustained yield.

Catches of ling cod (cultus) have increased to a marked extent (see Table 6), to compensate partially for the drop in sablefish production.

The soupfin and dogfish sharks continued to be the objects of an intensive fishery for Vitamin A products. The yield of soupfin had so diminished by 1948 that many of the former operators were leaving the industry. As a price level was maintained that somewhat compensated for the decrease in production, the decline was not felt by the industry until the level of abundance became so low that it was no longer masked. Many of the individuals who are now engaged in the fishery are doing so only until the gear that they possess is worn out. The expense of gear is such that the return to the fisherman is not sufficient to defray the costs of replacing the gear at current prices. Legislation was enacted which, although beneficial, is not sufficient in itself to enable the fishery to recover under present fishing levels. The only solution to the problem is a reduction of intensity.

The dogfish is taken by trawl nets in the northern part of the State, principally during December and January. As these fish are of the same group that range the coasts of Washington and Oregon, and as Northern California is about the southern limit of their commercial distribution, the effects of the increased otter trawl fishery have not been noticeable on this species.

Bottom fish investigations dealing with over 20 commercially important species were reinaugurated during this biennium. Personnel was assigned to this work, and some start made toward solving the problems necessary for adequate management of this industry. Log book records which, due to personnel shortage had suffered seriously during the war, were obtained; and the collection of these statistics in the future was outlined in conjunction with the objectives desired in this fishery. The reopening of the Eureka laboratory at the close of the biennium, and the assigning of part-time personnel to the collection of biological data will enhance the current analysis of the many species that are included in the scope of these investigations. Graduate students at Stanford University, working in cooperation with the bureau, have made valuable contributions to the life-history studies of the sand dab and starry flounder.

## CRAB

The crab fishery of Central and Northern California has undergone tremendous expansion since prewar days. This luxury item is now caught and marketed in mass production quantities. Ten years ago the catch was controlled by a tight organization that kept quantity low and price high. When the Eureka fishery developed to threaten the San Francisco monopoly, and when the more efficient trap or "pot" replaced the old

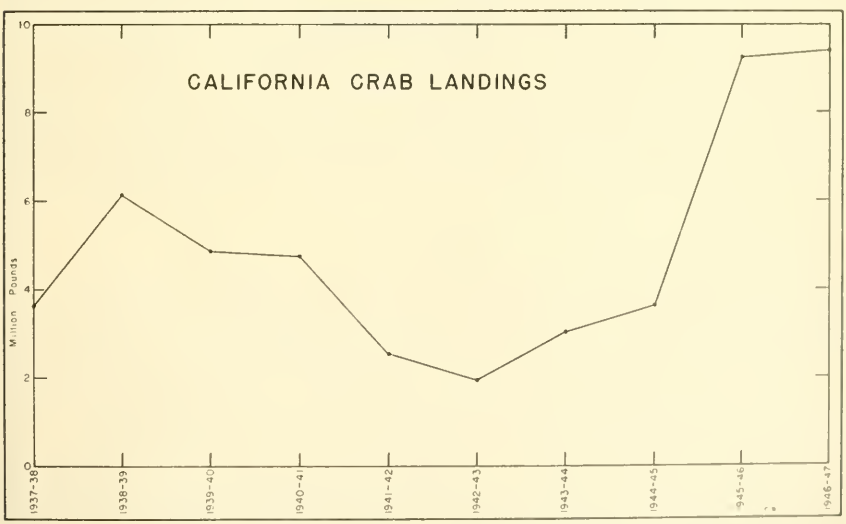



FIGURE 17. California crab landings, 1937-38 through 1946-47. Before the war, crab catches were restricted by a monopoly; during the war operations of the crab fleet were curtailed by security measures. The fishery is now undergoing the expansion usual to many of our fisheries

hoop net, catches increased considerably. After the war some of the trawlers that fish for sole and sand dabs modified their operations to fish for crabs. At the same time there was an expansion of "crab picking" to provide fresh and frozen crabmeat to restaurants. The catch increased from three or four million pounds a season to over 9,000,000 in 1945-46 and 1946-47 (see Figure 17). A small crab canning industry developed in the San Francisco and Eureka regions, with 15,000 cases (48 half-pound cans) produced in 1946, and 6,000 cases in 1947.

To prevent the waste and over-exploitation inherent in trawl operations, this type of crab fishing was curtailed by legislation enacted in 1947. As a result, the fishery is now on a more stable basis.

In early 1948 the bureau instituted a biological investigation of the crab to determine if the stock can withstand the intensified fishery and to ascertain what precautions might be necessary. This study is being made in cooperation with the fishery agencies of Oregon and Washington, under the sponsorship of the Pacific Marine Fisheries Commission.

## SQUID

During the biennium, the squid fishery centered at Monterey continued at a high level. Catches in 1946 exceeded all previous records, with landings reaching 38,000,000 pounds (see Figure 18). This enormous

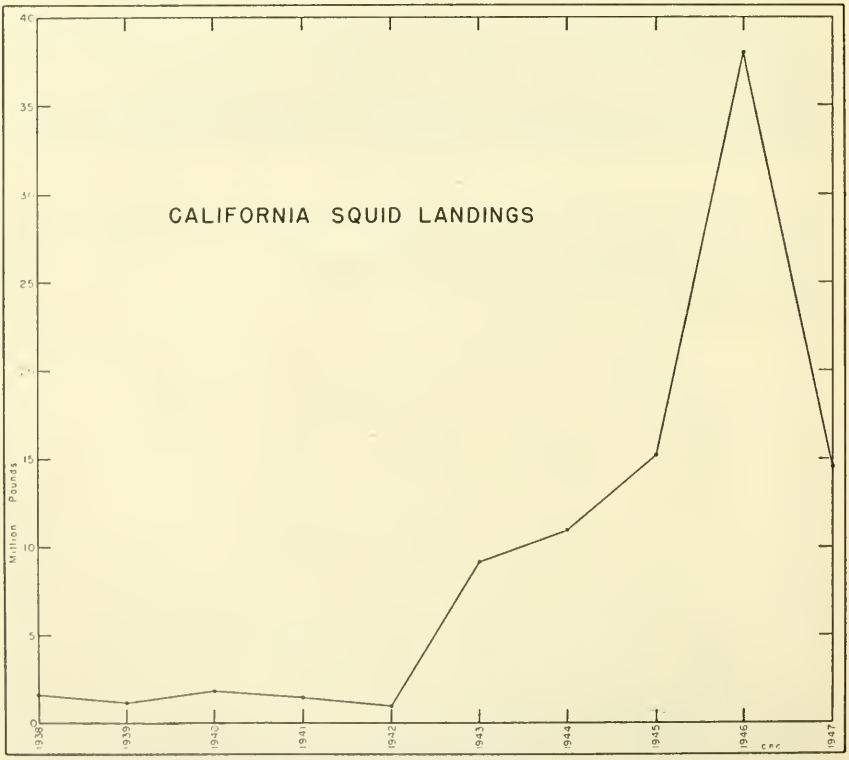



FIGURE 18. Poundages of squid landed in California, 1938-1947. The rapid increase after 1942 resulted from an expansion of the fishery in Monterey to supply a canning industry

catch was made to fill government orders for canned squid for relief exports. The pack exceeded 640,000 cases, which was more than double the sardine pack at Monterey for the same period. With relief purchases tapering off in 1947, the catch dropped to the 1945 level which was still far greater than earlier seasons. The 1947 catch of 14,500,000 pounds produced a pack of 230,000 cases.

To determine whether the expanded fishery might endanger the squid population, a biological study of the Monterey fishery was instituted in 1946. This investigation, carried on by Stanford University in cooperation with the bureau, includes length frequency samples, spawning and breeding habits, life-history of early stages, and assessment of possible damage to the eggs by the net fishery.

## ABALONE

Abalone landings continued to increase during this biennial period. The area about the Channel Islands, which could not be effectively worked during the war, has added an appreciable quantity to the usual take along the coast of the mainland.

A great many divers entered the fishery and caused something of a patrol problem. Many of these aspirants were construction divers, ex-navy men with some experience in shallow water rigs, or individuals with no experience, attracted to the fishery by what seemed to them to be very remunerative returns.

It requires a year or 18 months to make a proficient abalone diver; and most of the tyros were financially unsuccessful. Under normal conditions 12 to 15 abalone crews supply the market, but during the 1946-48 period 40 to 50 crews were operating. Most of the novices have been eliminated by their inexperience and consequent financial insolvency, and by the Bureau of Patrol which apprehended them trying to augment their earnings by taking undersized abalones.

Because of the expansion in this fishery, and the seriously overfished condition of the beds, the Legislature authorized drastic regulations to control the industry. Although illegal practices have been cut appreciably, there has been no general improvement in the stock of abalones; and it may be necessary to impose further restrictions which have already been authorized by the Legislature.

## OYSTER

Our oyster industry, which is based on an exotic species (*Ostrea gigas*) from Japan, suffered during the war from a lack of seed. We have not so far been able to obtain a natural set of these oysters, and the seed supply from Japan was, of course, not available. The stock of marketable oysters was practically exhausted by the end of the war.

An intermittent set of these oysters is obtained in the Puget Sound area, and some seed was imported shortly before shipments were resumed from Japan. The four oyster companies are building up their beds with yearly shipments of seed from Puget Sound and from Japan, and in a year or 18 months should again be producing a considerable quantity of desirable food.

In 1946-47 4,400 strings (equivalent to 1,500 cases) of seed were trucked in from Puget Sound, and 750 cases were shipped in from Japan.

In 1947-48 850 cases from Japan were planted in California.

All shipments from outside the State were inspected to ensure that no harmful pests were present. Observations of local spawning were made in an effort to determine what factors are responsible for the occasional success. Progress of the imported seed was observed, and we made one abortive attempt to introduce a Japanese hybrid variety which is reported to be very desirable.

## PISMO CLAM

In September, 1947, due to legislation enacted in an effort to conserve our rapidly decreasing stock, the Pismo clam of California was taken from the list of commercial species. In 1946 the local commercial take was 69,000 pounds and through September, 1947, the local take amounted to 58,000 pounds.

During 1946 approximately 11,408,000 pounds of Pismo clams were shipped into California from Mexico; in 1947 this figure was approximately 1,807,000. The drop from over 53,000,000 pounds in 1945 resulted because of a decrease in canning. Most of the present importations from Mexico are going into the fresh fish markets to meet a demand formerly supplied by local clams.

Pismo clam investigations were re-established in 1946, and the regular annual census at Pismo Beach resumed. No good sets on this beach occurred in either 1946 or 1947. In addition, a special study of the differential growth rate on various beaches of southern and central California is being made.

## OCEAN SPORT FISHING

This investigation is based on a record of the total annual marine catch taken by sport fishermen, and is obtained from data supplied by sport boat operators. The Bureau of Marine Fisheries, early in 1946, was able to resume the sport fishing program launched in 1936. A system, making it possible to check individual boat catch figures on any chosen day, was inaugurated. During 1947 a total of 87 sports boats were spot checked at their landings for the accuracy of their records. Within the first six months of 1948 approximately 100 boats were also tested for accurate reports.

The growth of the sport fishing fleet in the years 1946 and 1947 is reflected in the following table:

| | *1946* | *1947* |
|---|---|---|
| Number of boats | 150 | 378 |
| Number of fishermen | 206,979 | 439,270 |
| Number of fish caught | 1,227,818 | 2,392,016 |

Although 1948 promises to be a greater year than 1947, it is not expected that the increase will be so outstanding. Monthly summaries of the 1948 sport fishing season have been prepared and presented to various news services. These summaries have appeared regularly in several newspapers. Personal interview questionnaires have been used to some extent

FIGURE 19. Sport fishing aboard a party fishing boat in Southern California waters. About 400 boats are engaged in carrying anglers on fishing trips along the California coast. *Photograph courtesy of Pier Point Landing, Long Beach*

in an effort to determine how often the average fisherman tries his luck. Each boat owner and his operator received a mimeographed letter stating the aims of the Bureau of Marine Fisheries in regard to conservation of the sport fishing resources. Some of these operators, by arrangement, are furnishing specimens for identification and life-history work.

## BAIT FISHERY

Following the expansion of ocean sport fishing in Southern California, particularly since 1925, bait hauling as a supporting industry necessarily expanded at a proportional rate; and the Bureau of Marine Fisheries in 1938 instituted a system for determining the amount of live bait taken. The skipper of each bait boat is required to keep a daily record in numbers of scoops. Figures for the years 1939-1942 are on file. None are available from 1943 through 1945 as wartime security regulations practically eliminated bait hauling. Records for the last two years, 1946 and 1947, mark the beginning of a new era in the bait industry.

Bait landings also furnish an indication of the sardine spawning success as sardines during their first year of life constitute an important part of bait poundage. Indications are that spawning success was only slightly improved during this biennium over the 1940-1942 spawning seasons. All bait figures since 1939 fail to compare favorably with the sardine hatch of that year.

An attempt has been made to accompany each of the twenty-odd bait boats on at least one fishing trip during the calendar year. Essential information is gathered at this time. Boats are checked for the weights of the scoops, and this figure, multiplied by the total number of scoops, gives the total number of pounds taken as bait. A careful record is made of the gear in use, the proportion of species taken, and notes kept on innovations in the fishery.

Samples of anchovies and sardines are taken from every bait boat visited, and the age and length composition is determined. In 1946 and 1947, of the six species of fish commonly found in the bait catch, anchovy comprised 75 percent of the total, and sardines 20 percent, with the remaining 5 percent being composed of queenfish, kingfish, smelt, and pompano.

During this biennium many boats have installed submarine sounding devices to enable operators to detect subsurface schools of fish. One self-propelled bait receiver is in use, and a successful experiment has been made, utilizing cement bait receivers that are capable of floating without additional support. Extremely light aggregates are used in the cement. Bait boats in the Los Angeles Harbor area are now successfully fishing at night using floating lights which serve to attract and hold scattered fish.

## UNDERSEA OIL EXPLORATION

Exploration for undersea deposits of oil expanded rapidly during the biennium; and by 1948, 20 oil companies had applied to the Fish and Game Commission for permits to carry on such investigations. The oil-bearing strata are located by firing explosive charges in the overlying land or water surface. The bureau continued its regulation of this exploratory work through its permit system, and made additional investigations on the destruction of marine life which may result. A summary of these findings was published in *California Fish and Game*, April, 1948. An observer worked at sea at all times with the exploratory crews. Cost of this supervision is borne by the oil operators.

Because of the large number of applications for permits, the Bureau of Marine Fisheries in May, 1948, met with the oil companies, and through their aid set up preliminary arrangements for joint operations of all oil companies in future exploration. This will do away with repetition of activities in each area by additional oil companies. Thus, fish life will be saved, and the oil operators will carry out their research more economically. The waters of the State have been divided into 15 areas, and the dates designated when explorations will be permitted in each area. These dates are based on the seasons of the year when the fish population is known to be at a minimum in an area.

## SEA LIONS

In order to assess the extravagant claims made by fishermen that sea lions have increased to the point where they menace the fish supply, and the equally wild assertions of some naturalists that these animals are becoming extinct, the bureau keeps track of their numbers by means of periodic counts on the rookeries.

The count made in June, 1946, indicated that sea lions had increased somewhat. The 1947 census disclosed a population of 5,666 Steller sea

lions, and 3,050 California sea lions. These figures are somewhat below the 1946 counts, but a little above the previous average.

The 1948 count was incomplete because of adverse, foggy weather, and unavailability of equipment. Where the animals were counted, they were slightly less numerous than in 1947, but any differences noted were inconclusive.

In 1947, as in the previous year, some of the rookeries were counted from Navy blimps, through the courtesy of the Navy. The remainder of the counting, that year, and all the work in 1948 was done in cooperation with the Bureau of Patrol, using their planes and boats. The use of aerial photographs has increased the accuracy of these surveys.

The conclusion to be drawn from the counts is that the sea lion population appears to be in reasonable balance, and is neither becoming so high as to be dangerous to the fisheries, nor on the way to extinction. An epidemic caused numerous deaths among the California sea lions during the past winter, but no losses occurred among the Stellers. Several permits were issued for the commercial capture of sea lions to check possible excessive expansion of the population, but pursuit of the animals proved to be economically infeasible and only a few hundred were taken.

## RESEARCH VESSELS

Our seagoing research program was not resumed until late in the biennium for the lack of a vessel. The division's research vessel "N. B. Scofield" served throughout the war in the Army. At the conclusion of hostilities, negotiations for her return were initiated. These dragged on for month after month with the State exerting every possible effort to unravel military red tape. Finally, in June, 1947, the Army made a cash settlement of $65,000 for damage incurred, and returned the vessel. She was in deplorable condition, and it took the entire sum and months of work to put her in shape. The shakedown cruise was made in February, 1948.

The first postwar research voyage was made by the M. V. "N. B. Scofield" in March and April, 1948, as reported in the section on sardines. Before the biennium closed, the vessel had made some short trips offshore in tuna exploratory work, and to test gill net fishing for tuna.

Following the collapse of the sardine fishery, the fishing industry became aware of the need for additional research to solve the problems of fluctuating fish populations. It was realized that all available research agencies must work together and put the largest possible research fleet into operation. We felt that in order to take part in the expanded sardine research program, and at the same time do justice to the equally pressing problems facing the tuna, mackerel, and trawl fisheries, we would need at least one additional research vessel. For many months we sought a suitable craft, and finally located a surplus Army freighter that could be converted into a good research vessel. This ship, renamed "Yellowfin" for our most important species of tuna, was purchased on May 26, 1948. As the biennium ended, she was awaiting reconversion.

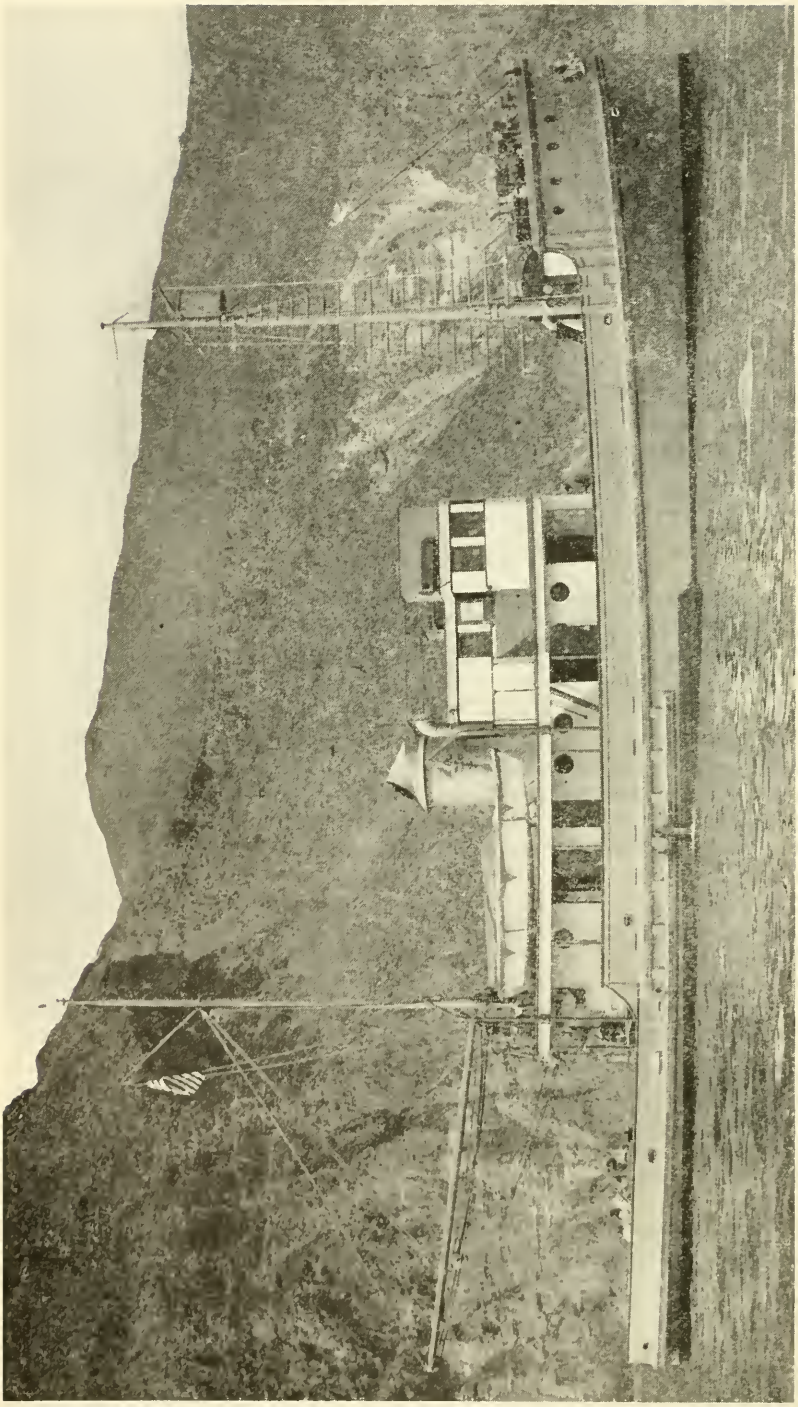


FIGURE 20. The M. V. "N. B. Scofield," research vessel of the Division of Fish and Game, near Ensenada, Lower California, on a sardine investigational cruise. This vessel, shown here on her first postwar research trip, was completely overhauled and rebuilt after returning from military service. *Photograph by John E. Fitch, March 27, 1948*

## FISHERIES STATISTICS

Due to the shortage of clerical help and lack of field work during the war years, it was with difficulty that California maintained the leadership it had held for 30 years in its system of fisheries statistics. But during the past biennium the back log of basic work was mastered with the aid of additional tabulating equipment and a normal clerical staff. Unfortunately, the field work is still lagging. The system has become complicated; and the danger of inaccuracies has mounted due to special concessions made to accommodate the industry, because of changes in delivery and marketing procedure, and through the use of the record for purposes other than the study of abundance.

In the spring of 1948 a conference was called to review the present laws and policies governing the collection and compilation of the statistical records. Plans were made for improvements which must be introduced gradually, but which will make the system function with greater efficiency and meet the needs of changing conditions.

With the return of the research men from war activities, resumption of the studies of specific species was of prime importance. Of these statistical studies, the sardine project was the only one which was carried on unabated during the war years. Despite the reduction in catch, the sardine still held first place in poundage in 1947 (255,500,000 pounds, $5,800,000 value). The combined poundage of the five tunas for 1947 threatened this lead, with the value six times greater than that of sardines (250,000,000 pounds, $39,000,000 value). It was therefore fitting that the tunas be given first attention in the postwar program. A statistical study of the yellowfin and skipjack was undertaken. Tabulations began with 1934 where the work had been dropped, and continued through 1947.

Jack mackerel had reached fourth place in poundage in 1947, and had usurped the place of Pacific mackerel in importance among the species. The Pacific mackerel study was resumed with tabulations for the year 1939, where it had been interrupted; and the Jack mackerel records were begun for this same year, to be carried through the current season. Salmon and bottom fish work started with tabulations for 1946, the intervening years' work to be completed when time permitted.

The marine sport catch record was nonexistent for several years because national safety restrictions curtailed the sport fishery, and no attempt was made to collect a record. In 1946 normal activities resumed, and by 1947 the volume of the record was enormous. During 1947 the volume of punch cards required for the 8,000,000-pound marine sport catch exceeded the volume of cards used for the 800,000,000-pound commercial catch. This volume was caused by the great number of sportsmen recording small and varied catches to make up the final total.

It is with satisfaction that we review the accomplishment of the past two years, for it brought out the fact that the statistical record of our fish catch had not lost value or continuity despite curtailment during the war years.

## PUBLICATIONS BY STAFF MEMBERS OF THE BUREAU OF MARINE FISHERIES

Fish Bulletin No. 65. Analysis of Populations of the Pacific Sardine on the Basis of Vertebral Counts. By Frances N. Clark. 26 pp.

Fish Bulletin No. 66. Drift and Set Line Fishing Gear in California. By W. L. Scofield. 38 pp.

Fish Bulletin No. 67. The Commercial Fish Catch of California for the Years 1945 and 1946. By the Staff of the Bureau of Marine Fisheries. 80 pp.

Fish Bulletin No. 68. Common Marine Fishes of California. By Phil M. Roedel. (In press at close of biennium.)

Fish Bulletin No. 69. Age and Length Composition of the Sardine Catch Off the Pacific Coast of the United States and Canada, 1941-42 through 1946-47. By Frances E. Felin and Julius B. Phillips. (In press at close of biennium.)

Fish Bulletin No. 70. A Preliminary Population Study of the Yellowfin Tuna and the Albacore. By H. C. Godsil. (In press at close of biennium.)

Alaska Codfish From California Waters. By J. B. Phillips. California Fish and Game, Vol. 32, No. 3, pp. 156-157.

Rare Fishes Taken Near Los Angeles. By Anita E. Daugherty. California Fish and Game, Vol. 32, No. 3, pp. 157-158.

California Sea Lion Census for 1946. By the Staff of the Bureau of Marine Fisheries. California Fish and Game, Vol. 33, No. 1, pp. 19-22.

The Effect of Explosives on Marine Life. By J. A. Aplin. California Fish and Game, Vol. 33, No. 1, pp. 23-30.

Pismo Clams of San Quintin, Lower California. By J. A. Aplin. California Fish and Game, Vol. 33, No. 1, pp. 31-33.

Pismo Clam Increase. By J. A. Aplin. California Fish and Game, Vol. 33, No. 3, pp. 129-131.

Rare Fishes Taken Near Los Angeles. By John E. Fitch. California Fish and Game, Vol. 33, No. 3, pp. 191-192.

Summary of Recovery of Califonrnia Sardine Tags on the Pacific Coast. By J. F. Janssen, Jr. California Fish and Game, Vol. 34, No. 1, pp. 3-10.

Basking Shark Fishery Revived in California. By J. B. Phillips. California Fish and Game, Vol. 34, No. 1, pp. 11-23.

Sablefish Run at Monterey Bay. By K. W. Cox. California Fish and Game, Vol. 34, No. 1, p. 37.

Occurrence of the Black Skipjack (*Euthynnus lineatus*) off Southern California. By Phil M. Roedel. California Fish and Game, Vol. 34, No. 1, pp. 38-39.

Extension of the Range of *Luvaris imperialis* Rafinesque. By W. E. Ripley. California Fish and Game, Vol. 34, No. 1, pp. 39-40.

Use and Effect of Explosives in California Coastal Waters. By J. E. Fitch and P. H. Young. California Fish and Game, Vol. 34, No. 2, pp. 53-70.

A Review of the Southern California Spiny Lobster Fishery. By Robert C. Wilson. California Fish and Game, Vol. 34, No. 2, pp. 71-80.

1947 Pismo Clam Census. By the Staff of the Bureau of Marine Fisheries. California Fish and Game, Vol. 34, No. 2, p. 82.

Landings of Sardines Along the Pacific Coast. California Fish and Game, Vol. 34, No. 2, pp. 82-83.

The California Sea Lion Census for 1947. By P. Bonnot and Wm. E. Ripley. California Fish and Game, Vol. 34, No. 3, pp. 89-92.

Some New and Unusual Fishes From Southern California. By J. E. Fitch. California Fish and Game, Vol. 34, No. 3, pp. 133-135.

Comparison of Calculated Fish Lengths Based on Scales From Different Body Areas of the Sardine, *Sardinops caerulea*. By J. B. Phillips. Copeia, 1948, No. 2, pp. 99-106.

Pacific Mackerel in the Gulf of California. By Phil M. Roedel. Copeia, 1948, No. 3. (In press at close of biennium.)

Circular No. 21, Statistical Report on Fresh and Canned Fishery Products, Year 1946.

Circular No. 22, Statistical Report on Fresh and Canned Fishery Products, Year 1947.

## PACIFIC MARINE FISHERIES COMPACT

During their 1947 sessions, the State Legislatures of Washington, Oregon, and California enacted legislation authorizing the execution of the Pacific Marine Fisheries Compact. The governors of the three states subsequently executed the compact, the purposes of which are expressed as follows: "The purposes of this compact are and shall be to promote the better utilization of fisheries, marine, shell, and anadromous, which are of mutual concern, and to develop a joint program of protection and prevention of physical waste of such fisheries in all of those areas of the Pacific Ocean over which the States of California, Oregon, and Washington jointly or separately now have or may hereafter acquire jurisdiction."

The compact sets up the Pacific Marine Fisheries Commission, and designates the fisheries agencies of the three states to act as its joint research body. Organizational meetings were held at Portland, Oregon, in November, 1947, and January, 1948. The research staffs held a joint meeting in San Francisco during March, followed by the third meeting of the commission in April at San Francisco. The commission is formulating recommendations on conservation legislation for the consideration of the member states, and is coordinating the various research programs.

The California members of the commission, appointed by the Governor, are:

Mr. Richard S. Croker, Chief, Bureau of Marine Fisheries.
Senator Jesse Mayo, Angels Camp.
Mr. Eugene D. Bennett, San Francisco.

A staff member of the Bureau of Marine Fisheries, Mr. D. H. Fry, Jr., has been placed in charge of California's share of the cooperative research program.

## BUREAU OF FISH CONSERVATION

An understanding of the present program of the bureau is basic for a consideration of expansion or change in operations. A short time before the war a plan for future operation was approved by the commission and the accomplishments thereunder have been reported upon informally from time to time and at regular intervals in the biennial reports. There have naturally been some modifications and the war necessitated deferment of many activities that had been planned.

A long-term program with definite objectives is particularly desirable for the conservation work of public agencies because of the continued demand by interested individuals and groups for innumerable short-term activities which are never coordinated and in fact, are usually abandoned by the proponents for new fads or fancies before the original objectives are attained. Regardless of the individual merits of the projects, little worthwhile can be accomplished if the division is forced to abandon them before completion to undertake some new ventures. The waste of time, effort and money resulting from such unplanned activity can be largely, but not completely, avoided by setting up a sound long-term program and sticking to it except for minor modifications. Even though the plan may be in part defective, the results of long-term coordinated work are bound to be more profitable than hit or miss work, even on a large scale.

The present program of this bureau has three broad objectives, and under each, a number of related fields of activity. They can be most concisely presented in outline form.

1. Protection and improvement of environment and habitat for fishes. In other words, to provide satisfactory living conditions for fishes. The main lines of activity in this field are:

   a. Protection of existing fishing waters from the adverse effects of the utilization of water for other purposes. It is hardly necessary to point out that the use of water for domestic use, irrigation, power and industrial purposes is continuing to increase. One thousand one hundred twenty-six applications for new diversions were filed during the biennium. There are over 600 dams now existing in the State, and many more are planned or under construction. In order to make proper recommendations for the protection of fish it is necessary to study each of these projects in detail and frequently the problems are so complex that the studies extend over a considerable period of time. It has been found that many adjustments in construction or operation are possible which make these projects less damaging to fish life, and where negotiation fails to bring satisfactory adjustment, recourse is had to the provisions of law for the release of water and the construction of fish ladders and screens. Screening of diversions will only be possible on a large scale after the revision of the present screen law.

b. Stream flow maintenance in certain areas of the high Sierra Nevada has been found possible in past years through the construction of small storage dams. Two areas, Desolation Valley and Cherry Creek, have been developed through cooperation with local sportsmen and the U. S. Forest Service. This work is only possible where suitable sites exist, but several additional areas are known where more dams could be constructed.

c. An increasingly important factor affecting waters of this State as habitat for fish is pollution by industries and municipalities. The amount of waste that State waters are called upon to handle increased greatly during the war, and will remain at a high level because of the great growth in the population of the State. Enforcement of the pollution laws is in the hands of the Bureau of Patrol, but the Bureau of Fish Conservation supplies the technical service needed in connection with most pollution cases. One Assistant Sanitary Engineer is assigned to the work, and his time is fully occupied. It may therefore be necessary to add another man to the staff next year.

It has become more and more evident that the complexity of many pollution problems makes it necessary for us to seek advice and assistance from other interested agencies, particularly the State Department of Public Health. Such cooperation is mutally advantageous and could be facilitated by such enabling legislation as was proposed at the last session of the Legislature, but which failed of passage. The most serious pollution is now caused by food processing plans and municipal sewage, or a combination of the two. Although partial removal of cannery sludge is by no means a complete solution, it is recommended that the commission continue in effect the present regulation requiring screening of cannery sewage.

d. In 1945, the bureau was given the difficult task of handling the screening of diversions. For a considerable period prior to that administrative change, installation of new screens was confined to replacement of old screens since the law provided that all new installations be paid for and maintained jointly by the owner and the division. The obvious difficulties of accounting, particularly since bills for maintenance are rendered to us by the owner and in most cases we would have no means of checking the labor involved, were a bar to the installation of new screens. Furthermore, very few of the screens installed in the past had ever been consistently tested to determine their efficiency in doing the job of stopping small fish. It has therefore been necessary for us to develop our program slowly. To start with, we set up a fish screen and maintenance crew, largely with new personnel. A quonset building was set up in Yreka as a shop and new equipment ordered. Study was immediately given to the efficiency of various types of screens, both new and old, and that work is still continuing. We believe that in the near future we will be ready to undertake an expanded program of new installations, providing changes can be made in the law. It is recommended that these

changes include provision for the installation and maintenance by the division of all screens in ditches except those constructed by the United States and those supplying water for power generation.

Part and parcel with screen installation is the problem of maintaining and improving some of the older ladders. In the northern part of the State there are many old ladders which should be reconstructed. Most of them were installed according to specifications and in good faith. Many of them have been known to be inadequate, and by law the division is authorized to replace them.

During the last two years we have removed several abandoned dams in order to make streams passable by fish. The actual removal of these dams is not difficult, but it is a tedious process finding the owners and getting their consent to the removal. Both ladder reconstruction and dam removal should be continued as rapidly as possible.

e. Rough fish control is one of the newer techniques which has been found very effective in increasing productivity of certain waters. It is usually accomplished through the use of rotenone, the well-known insecticide. Waters can be treated to remove all fish life at a cost for materials of from $0.60 to $1.20 per acre-foot of water. Gull Lake, Mono County, was the first large lake treated. This work was done in 1940, and improved fishing was evident after replanting the following season and continued through the war years. Although rough fish are again present, they have not yet become so abundant as to limit trout production. Rehabilitation of lakes and reservoirs by this method is very worthwhile even though the waters may eventually become restocked with rough fish. During the present biennium money has been budgeted for the purchase of poison and a large number of waters have been treated.

2. The second broad field of activity is that of study and research. The number of questions of fact regarding fish and game that are raised at almost every commission meeting, many of which remain unanswered, are an indication of the continuing need for the gathering of facts about our fishes and fishing waters and their proper management. The Fish Commission of California was established in 1870, but no full-time aquatic biologist was employed until 1925. That lone individual worked until his death in 1930, and the division then entered into an agreement with the U. S. Fish and Wildlife Service for what was known as the Cooperative Trout Investigations, and it was not until 1937 that the division made any provision in its own organization for the work of trained biologists on fresh-water fishery problems. That staff was reduced to four individuals all during the war period.

For purposes of organization, the State has been divided into eight districts and eventually it is hoped that it will be possible to place each district in charge of an experienced biologist, who can have two or three assistants. The present assignment of the permanent biological employees by districts is indicated on the following map.

The fact-finding program includes the following major projects to which could be added many minor routine problems that come up from day to day.

a. The physical inventory to determine the size, type, location and general suitability for fishes of the thousands of separate rivers, creeks, ditches, lakes, reservoirs, and ponds of the State is known as stream and lake survey. This is a continuing job which will never be completed because of the changes which are constantly taking place, and it is therefore carried on as opportunity permits.

b. The formulation of plans for management, including recommendations for seasons, size limits, bag limits, stocking, and improvement and protection of environment.

c. Determination of the best management techniques and practices through study of survival of planted and natural fish of various sizes and species under varying conditions, effect of stocking or removal of species. Work of this kind is now being carried on at Castle Lake, Siskiyou County; Clear Lake, Lake County; Millerton Lake, Fresno County; Santa Paula Creek, Ventura County; and Rush Creek, Mono County. Creel counts are being carried on at various times on the Truckee River, Upper Truckee, Shasta Lake, Conn Reservoir, and Stevens Creek Reservoir. Annual counts of salmon are made on the Eel River, Mad River, and Klamath River. Recovery of marked fish is being used at Lake Almanor to determine results of planting. A special project along these lines is now under way to determine the degree of depletion, if any, in the striped bass fishery and the further essential facts as to life history of the species in California necessary for management and protection from any adverse effects of the Central Valleys Project.

d. The study and treatment of hatchery diseases and the development of cheaper and better foods for hatchery use. Work along these lines has paid large dividends during the last eight years. Disease epidemics have been less severe, and our cost for fish food has been kept near prewar levels, while soaring in other states. Biologists have also assisted in recent experiments with planting trout from airplanes.

e. The biological staff also has to bear most of the increasing burden of preparing material for educational literature and movies, and speaking at sportsmen's meetings. Accompanying this report is a list of titles and abstracts of administrative reports and publications prepared by the biological staff July 1, 1946, to June 30, 1948.

3. Fish planting is the largest activity of the bureau, both in terms of expenditure and number of men employed. Over 20,000,000 trout and 3,500,000 salmon, weighing over 440,000 pounds, are now being produced in hatcheries for planting. Varying numbers of trout and salmon are obtained through rescue work and this is also the source of most of the warm-water species used for stocking. The division now has 22 permanently established trout hatcheries (at two of these salmon are also

reared), one hatchery for spiny-rayed fish, three hatcheries in experimental use and development, and one hatchery under construction. It is to be understood that the term hatchery as used in this report means a building where fish eggs are hatched and fingerlings produced, or a group of rearing ponds or possibly a combination of the two types of facilities.

The following is a list of the existing fish hatcheries operated by the Bureau of Fish Conservation during the biennium.

ALPINE COUNTY

Alpine Hatchery near Markleeville (seasonal). Temporarily closed. 30 troughs, no tanks or ponds.

FRESNO COUNTY

Huntington Lake Hatchery near Lakeshore (seasonal). 6 tanks, 16′ long; 3 are standard width of 4′ and 3 are less than 4′ in width.

Kings River Hatchery, 56 miles east of Fresno. 100 troughs, no tanks or ponds.

HUMBOLDT COUNTY

Prairie Creek Hatchery near Orick. 80 troughs, 5 redwood tanks, 4′ x 16′ x 30″, located outside of hatchery building.

INYO COUNTY

Mt. Whitney Hatchery and Black Rock rearing ponds near Independence. 120 troughs, 2 circular ponds, and 3 rectangular ponds at hatchery, used largely for spring spawning rainbow brood stock. Two large rearing ponds and one brood stock pond are maintained at Black Rock Springs.

KERN COUNTY

Kern Hatchery near Kernville. 10 troughs, 2 round redwood tanks 14′ in diameter, 30″ deep. 8 concrete ponds, 80′ x 12′ x 36″, two earth raceways divided into 5 compartments each, length of each raceway about 300′, average width about 6′, depth of water 14″.

LASSEN COUNTY

Lake Almanor Hatchery near Westwood. 96 troughs, 8 redwood tanks, 4′ x 16′ x 30″, located in hatchery building, and 3 cement ponds approximately 8′ x 30′ x 30″.

LOS ANGELES COUNTY

Whittier Hatchery. 6 ponds, 100′ x 12′. Temporary.

MADERA COUNTY

Madera Hatchery near Bass Lake (seasonal). 4 troughs, 10 tanks, 16′ x 4′ x 30″.

MARIPOSA COUNTY

Yosemite Hatchery in Yosemite National Park. 52 troughs, 4 tanks 16′ x 4′ x 24″.

MONO COUNTY

Hot Creek rearing ponds near Bishop. 34 troughs, 35 rearing ponds, 2 brood stock ponds.

PLACER COUNTY

Mt. Tallac Hatchery near Camp Richardson (seasonal). 52 troughs, 16 tanks 4′ x 16′ x 30″.

Tahoe Hatchery near Tahoe City, 64 troughs, no ponds or tanks.

PLUMAS COUNTY

Feather River Hatchery near Clio. 60 troughs, 4 circular ponds, 20′ in diameter, concrete construction.

SACRAMENTO COUNTY

Central Valleys Hatchery near Elk Grove. 19 bass ponds, 19 daphnia tanks.

SAN BERNARDINO COUNTY

Mojave River Hatchery near Victorville. 4 ponds. Put in operation June, 1947.

SANTA CRUZ COUNTY

Brookdale Hatchery near Brookdale. 40 troughs, 6 circular concrete ponds 16′ in diameter with an average depth of about 16″. One rectangular pond, concrete construction, approximately 35′ long, 12′ wide, average depth about 16″.

SHASTA COUNTY

Burney Hatchery near Burney. 100 troughs, no ponds.

Crystal Lake Hatchery. 24 ponds constructed and put in operation October, 1947.

SIERRA COUNTY

Yuba River Hatchery near Camptonville. 30 troughs. There are no ponds or tanks at this hatchery.

SISKIYOU COUNTY

Fall Creek Hatchery near Copco. 116 troughs, 9 ponds.

Mt. Shasta Hatchery near Mt. Shasta City. 458 troughs, 47 brood fish rearing and spawning ponds. 36 ponds of earth bottom and wood side construction are used for the holding of approximately 20,000 rainbow brood fish. Eleven ponds are used for the rearing of aged fish for planting and also to bring on fish to be set aside for brood stock.

TULARE COUNTY

Moorehouse Spring Hatchery near Porterville. 6 redwood tanks 14′ in diameter, 30″ deep. Put in operation June, 1947.

Kaweah Hatchery near Three Rivers. 60 troughs, no tanks or ponds.

Sequoia Hatchery near Visalia. Ten 14′ round redwood tanks, 30″ deep.

TUOLUMNE COUNTY

Basin Creek Hatchery near Tuolumne. 80 troughs, 9 tanks 16′ long, 4′ wide, 30″ in depth.

VENTURA COUNTY

Fillmore Hatchery near Fillmore. 8 troughs, 3 circular tanks, 30 rearing ponds.

The operation of all fish hatcheries is carried on under the direction of the Supervisor of Fish Hatcheries and seven Assistant Supervisors. One of these assistants has headquarters in San Francisco and has charge of the acquisition of property, equipment, and the planning of maintenance and the construction of new facilities. The other six supervisors have charge of the hatcheries in the various districts indicated on the attached map, which shows the location of existing and proposed hatcheries.

Tables in the appendix show the number of the hatchery-produced trout and salmon planted in each county in 1946.

## PUBLICATIONS BY STAFF MEMBERS OF THE BUREAU OF FISH CONSERVATION

Development of Teeth in the California Fish *Atherinops affinis*. Garth I. Murphy. Copeia, 1947, No. 3, pp. 198-199.

Report on Fisheries Resources in Connection With the Proposed Yolo-Solano Development of the United States Bureau of Reclamation. Leo Shapovalov. California Fish and Game, Vol. 33, No. 2, pp. 61-88.

Distinctive Characters of the Species of Anadromous Trout and Salmon Found in California. Leo Shapovalov. California Fish and Game, Vol. 33, No. 3, pp. 185-190.

A System for Recording Measurements of Fish Scales. Leo Shapovalov. Transactions of the American Fisheries Society, Vol. 74, pp. 59-62.

The Steelhead Fishery. Leo Shapovalov. Pp. 22-36 of Co-ordinated Plans for the Management of the Fisheries of the Pacific Coast, submitted to the Pacific Marine Fisheries Commission, April 5, 1948. Processed.

"King and Silver." Leo Shapovalov. Tyee Tales, April, 1947.

Digest of California Angling Regulations. Prepared by Leo Shapovalov. California State Printing Office, May, 1947.

A New Transplant of the Piute Trout (*Salmo clarkii seleniris*) from Silver King Creek, Alpine County, California. Elden H. Vestal. California Fish and Game, Vol. 33, No. 2, pp. 89-96.

Castle Lake Trout Investigation, First Phase: Interrelationships of Four Species. J. H. Wales. California Fish and Game, Vol. 32, No. 3, pp. 109-143.

Castle Lake Trout Investigations: 1946 Catch, and Chemical Removal of All Fish. J. H. Wales. California Fish and Game, Vol. 33, No. 4, pp. 267-286.

California's Fish Screen Program. J. H. Wales. California Fish and Game, Vol. 34, No. 2, pp. 45-52.

Spawning Habits of the Striped Bass (*Roccus saxatilis*) in California Waters. Chester Woodhull. California Fish and Game, Vol. 33, No. 2, pp. 97-102.

SUPERVISORIAL AND BIOLOGICAL DISTRICTS AND LOCATION OF FISH HATCHERIES AND REARING STATIONS OF THE BUREAU OF FISH CONSERVATION, CALIFORNIA DIVISION OF FISH AND GAME

FIGURE 21

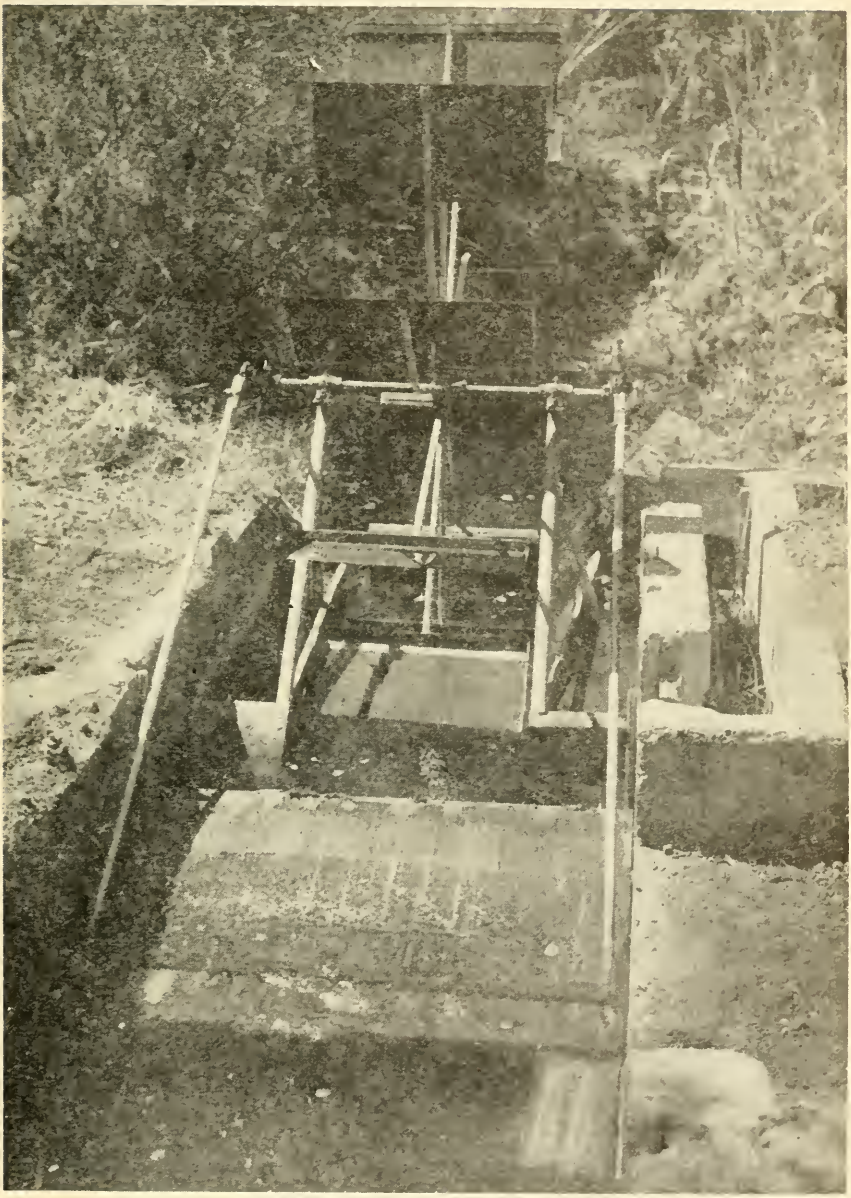


FIGURE 22. Perforated plate fish screen with cleaning bar developed by E. W. Murphey of the Division of Fish and Game and now under test on a tributary of the Shasta River. This screen has the characteristics of simplicity and low fabrication, installation and maintenance cost. It is particularly adapted to small ditches

## Titles and Abstracts of Administrative Reports Submitted by the Biological Staff July 1, 1946, to June 30, 1948

CALHOUN, Alexander J.

Observations of the Striped Bass Fishery in the Sacramento Delta Area during April and May of 1946. Submitted July 11, 1946, 36 pp., 4 tables, 6 figures.

*Abstract:* Methods used in sampling the livery boat fishery are described. Fishing effort and average daily catch at Frank's Tract are discussed. Length frequencies and sexual maturity of the catch are discussed. The fishery in the main San Joaquin River is described. Average daily catch was between 1 and 2 bass per angler day in most samples taken. Fish were ripe almost without exception, and females averaged 26.5 inches, males averaged 18.5 inches, in the samples measured. Migration and spawning time, as revealed by catch observations, are taken up. The desirability of a closed season during the time of spawning is discussed, and it is concluded that such a measure has little to recommend it.

1944 Angling Catch Records of California. Submitted December 12, 1946. 18 pp. and tables.

*Abstract:* Results of the postal card survey of California angling catches in 1944 are presented. An estimated 1,420,000 striped bass were caught. Other estimates pertaining to the 1944 striped bass catch are derived and discussed. Other species are not considered because of the restricted scope of the 1944 survey.

Progress Report on Studies of Striped Bass Reproduction in the Central Valley, with a preliminary evaluation of the threat of the Delta Cross-Channel to the striped bass population. Submitted November 20, 1947. 49 pp., 3 figures.

*Abstract:* Distribution and abundance of early stages of striped bass in the Central Valley in 1947 on the basis of tow-net samples are outlined. Behavior of eggs, larvae and fry in response to currents is discussed, and it is concluded that prediction of losses of small bass at the Delta-Mendota pumps is impossible on the basis of present information.

Analysis of 1946 Striped Bass Party Boat Fishing Effort. Submitted March 9, 1948. 7 pp., 1 table.

*Abstract:* This report presents a breakdown of 1946 party boat permits issued in the San Francisco office by type of operator, as well as estimates of fishing effort expended by the various types, and for the striped bass party boat fishery as a whole.

CURTIS, Brian

The Status of the Salton Sea Mullet Fishery. Submitted October 30, 1946. 5 pp., 2 tables.

*Abstract:* Recapitulation of 1946 catch shows totals of 30,000 fish weighing 174,000 pounds, lowest since resumption of fishery in 1943, but probably due in part to death of many mullet in late 1945. Catch per net unit 3.5 pounds. No significant index of depletion. Maintenance of present regulations is recommended for 1947, with a biological study to delimit the spawning season.

Report of the activities of the biological staff of the Bureau of Fish Conservation for the 39th Biennium, July 1, 1944, to June 30, 1946. Submitted November 15, 1946.

*Abstract:* Describes the activities of the staff. Printed in large part in "Thirty-ninth Biennial Report of the Division of Fish and Game" as part of the report of the Bureau of Fish Conservation.

The Frog Lake (Nevada County) Fishery in 1946. Submitted April 7, 1947. 14 pp., 5 tables, 1 figure.

*Abstract:* Four years of planting 15,000 RT annually, after four years of planting equal number of RT, EB and BN, leave the BN still dominant in the catch (58 percent). Poor showing of RT is discussed; gill netting of large BN is recommended, and test of fall-spawning RT survival vs. spring-spawning stock.

Catch estimates and creel counts in California. Prepared for presentation on June 4, 1947, at Santa Fe meeting of Western Association of State Game and Fish Commissioners. 13 pp.

*Abstract:* Description of mail questionnaire used in sampling angler's catch and of methods of estimate. Estimates are given for the years 1936-1943. Correlation with survival data from creel counts indicates that only about one-eighth of total trout catch results from hatchery planted trout.

DILL, William A.

Trout and Salmon of California. 10 pp.

The Warm-Water Fishes of California Fresh Waters. 10 pp. Both submitted January 21, 1948.

*Abstract:* Brief discussions and descriptions of the various fishes, prepared for use at the wardens' schools conducted by the Bureau of Patrol.

DILL, William A., & SOULE, Scott M.

Paper work in fish management. Report No. 3. Establishment of standard methods. Submitted January 25, 1947. 11 pp. including 2 figures.

*Abstract:* Discusses need for uniformity and correlation in: Records of all files (in all offices) concerned with management; and in all instructions for use of files, forms, and procedures. Outlines present status of "standard" sets of instructions: Stream and lake survey (and forms); use of management binder system; filing and indexing of all types of stream and lake records. Defines "standard" methods and procedures. Explains necessary steps to take in preparing them and explanations. Lists bottlenecks to accomplishment of above.

Paper work in fish management. Report No. 4. A suggested set of instructions for use of the management binder system. Submitted January 25, 1947. 3 pp. letter plus set of instructions, ii plus 23 pp. (incl. 1 fig.) plus 4 pp. addenda.

*Abstract:* Instructions designed for use of hatcherymen, biologists, central office. Explains forms used in binder, how to fill them out, their arrangement and indexing; how to keep binders up to date; interrelationships of the three offices. Has filled-out sample forms. Accompanied by letter of explanation and miscellaneous addenda.

A fisheries survey of lakes in the Granite Creek Drainage, Madera County, 1946. Submitted April 29, 1948. 52 pp. including 3 figures (maps), 8 tables and 2 appendixes.

*Abstract:* Results of a July 1946 survey of 24 natural high-altitude trout lakes. Explains why past management has not been satisfactory. Gives general description of drainage, lakes, fish populations, accessibility, and fishing intensity. Compares past stocking with present fish populations. Recommends definite management practices including a new stocking policy, improvement work, improvement of field knowledge (by hatchery personnel) and records. Recommends additional surveys in areas. Gives methods (including a stocking table) and itinerary of 1946 trip. It is shown that despite little stocking, the "carry over" of hatchery fish may be high, and that natural propagation may often be sufficient to provide satisfactory fishing.

EVANS, Willis A.

Reconnaissance of Upper Sweetwater River, San Diego County, with reference to stream improvement. Submitted August 30, 1946. 8 pp. plus 1 map.

*Abstract:* The Sweetwater River was examined from Lake Loveland to headwaters. Conditions found unsuitable as year around habitat for trout below Hulburd Grove. Area within Cuyamaca State Park is only section satisfactory for permanent trout stream. Cold Spring Creek is best area. A two-mile section of it is recommended for stream improvement work in form of small rock check dams, done cooperatively by Division of Fish and Game and Division of State Parks. After improvement, plant with aged fish. Extreme headwaters should be planted with fingerling RB trout at periodic intervals of 4-5 years. The map indicates section of stream suitable as trout habitat.

FRASER, J. C.

Poisoning of McMurray Lake, Nevada County. Submitted January 15, 1948. 9 pp., 1 photo, 1 table.

*Abstract:* McMurray Lake, Nevada County, was poisoned with rotenone on September 14, 1947, to rid it of a large population of catfish. Report describes character of the lake, the poisoning program, and observations made during and after the poisoning. Seven brown trout were recovered and 22,672 catfish with an average length of 4.7 inches were actually counted. Catfish population was estimated at 33,000.

The Frog Lake (Nevada County) Fishery in 1947. Submitted March 21, 1948. 10 pp., 5 tables.

*Abstract:* 203 anglers fished 767 hours and caught 431 trout as follows: RT 85 (20 percent), EB 128 (30 percent), BN 218 (50 percent); average catch per angler 2.1; per angler hour 0.56. Fishing better than in 1947. BN still dominate catch; EB are increasing, probably due to natural reproduction; RT not increasing significantly. Marked RT were planted in 1947 in four groups; spring spawning and fall spawning from Mt. Shasta; same from Tallac. Objective: To determine relative survival by intensive counts in 1948.

MURPHY, Garth I.

A survey of Stony Creek, Grindstone Creek, and Thomas Creek drainages in Glenn, Colusa, and Tehama Counties. Submitted September 2, 1946. 28 pp., 25 photos.

*Abstract:* Brief survey to determine extent of trout in above drainages. In general trout water starts at 2,500 feet. Streams are relatively inaccessible, and well stocked with trout. Little planting needed. Streams lack adequate shade causing excessively warm water. Several possible hatchery and rearing pond sites discussed. Recommended: That a holding pond be established to accommodate at least 37,000 RT at 15 per ounce and that these fish be distributed by pack stock in Middle Fork of Stony Creek, Grindstone Creek, Killdry Creek, and Thomas Creek, that in cooperation with U. S. Forest Service increase of shade be attempted experimentally by planting willows and alders on a one-quarter mile section of South Stony Creek.

Clear Lake, Lake County, Investigation. Progress Report No. 1. Submitted September 27, 1946. 6 pp.

*Abstract:* A report on the material gathered during the summer of 1946, with recommendations for future investigations.

Observations on Conn Valley Reservoir, Napa County, on July 18 and August 3, 1946. Submitted September 27, 1946. 8 pp., 5 photos, 1 map.

*Abstract:* Thermocline at about 13 feet, with no $0_2$ below. Water 75 degrees and up above thermocline. RT concentrated in creek arms where water slightly cooler. A research program for Conn Valley Reservoir or Stevens Creek Reservoir suggested and outlined.

Notes on Hardhead Control in the East Fork of Russian River, Mendocino County, California. Submitted November 17, 1947. 9 pp., map and 3 figs.

*Abstract:* Described the drainage of Potter Valley, a series of erosion control check dams in the valley, and the distribution of fishes in the waters. Apparently Hardhead (*Mylopharodon*) are either present as resident, nonmigratory populations above a 7-foot 6-inch barrier or are able to surmount the obstacle during their spawning migration. Additional studies to clarify this problem are suggested.

The Fishery of Clear Lake, Lake County, California. Submitted March 15, 1948. 60 pp., 10 figs., Tables I-XXII, App. 1, Exhibits A and B, App. II, Tables A-G.

*Abstract:* General report on investigation of Clear Lake 1946-1947. Includes descriptive material on Clear Lake, growth rate studies of important fishes, analysis of the commercial and sport catch of Clear Lake, history of the fishery, description of a closed season experiment, and a discussion of the rough fish population of Clear Lake. * * * The populations of fishes in Clear Lake are in a healthy condition and are not suffering from overfishing. The sport catch consisting of 70 percent catfish, 10 percent LMB, 10 percent BCR, and 10 percent BG, remained relatively stable 1936 to 1944. The 1946 catch was off about 40 percent, apparently correlated with a decline of rough fish population, indicating that game fish had decreased in numbers when their supply of forage decreased. * * * Closed season experiment indicated that LMB will respond favorably to protection during spawning, in terms of numbers of young produced. * * * In order to bring Clear Lake into full production, it will be necessary to increase the forage fish supply. Differential protection applied to LMB should increase their percentage of the total population, probably at the expense of competing species such as white catfish and crappie.

MURPHY, Garth I., and CHANDLER, Harry P.

The Effect of TDE on Fish and on the Plankton and Littoral Fauna in Lower Blue Lake, Lake County, California. Submitted June 25, 1948. 33 pp., 2 figs.

*Abstract:* Lake was treated by the Department of Agriculture with TDE in a Xylene-Triton emulsion November 7, 1947, at the rate of 1 part to 45 million to rid it of the Clear Lake gnat *Chaoborus astictopus* D & S. Daily samples of water, plankton and fish were taken by Division of Fish and Game and other observations made for five days before and seven days after the treatment with an occasional sample during the next two months to determine the effect on fish and fish food organisms. The insect and crusteacea fauna was so greatly reduced that it is doubtful that the fish could maintain themselves. After six weeks some species of crusteacea gained former numbers (not volume). Large numbers of black crappie (the most abundant fish) were killed. Experiments were carried out to determine the relative toxicity of different concentrations of various insecticides on three species of fish. The gnat was apparently eliminated according to U. S. Department of Agriculture report.

SHAPOVALOV, Leo

Report on Fisheries Resources in Connection With the Proposed Yolo-Solano Project of the United States Bureau of Reclamation. Submitted July 5, 1946. 50 pp., incl. 20 photos, plus 1 map.

*Abstract:* The proposed Yolo-Solano Project of the U. S. Bureau of Reclamation is a multiple-purpose feature of the Central Valley Project, providing for irrigation, domestic water supply, power, salinity control, navigation, and recreation benefits. In general, it involves (1) the storage of runoff waters from Cache and Putah Creeks in Lake and Napa Counties, by means of three large reservoirs and dams and (2) diversions from the Sacramento River at Knights Landing and Lindsey Slough. Construction of reservoirs on tributaries of Clear Lake is also being considered.

The report describes the proposed project and existing conditions, prognosticates changes in the fish populations and fisheries apt to result through the construction of the project, and presents recommendations in regard to the construction and operation of the proposed works which will insure the maximum development and utilization of the waters involved as sport fishing areas.

Recommendations include initial heavy stocking of LMB in Monticello Reservoir and Putah Creek Rediversion Dam Reservoir, control of undesirable fish species above site of Indian Valley Dam and subsequent stocking of RT in Indian Valley Reservoir and screening and maintenance of flows where needed.

SOULE, Scott M.

Poisoning Shaver Lake, Fresno County, California. Report No. 1. Investigation as to Conditions Necessary and Feasibility. Submitted April 22, 1947. ii plus 19 pp., incl. 1 fig. and 3 tables.

*Abstract:* Gives general description of Shaver Lake, including brief summary of Southern California Edison Company hydro-electric development on San Joaquin River. Mentions possibilities of controlling poisoned water with outlet diversion closed and with outlet diversion flowing (depending on dilution to prevent fish loss below). Lists conditions necessary for poisoning. Discusses feasibility and concludes poisoning is feasible only if Edison Company will make a special effort to control the lake to provide conditions necessary for the poisoning.

An Analysis of Trout Scales From Conn Valley Reservoir, Napa County, 1947. Submitted April 25, 1948. 14 pp.

*Abstract:* Scales from 99 of the 2,980 rainbow trout checked at the reservoir May 1-4, 1947, were analyzed on the basis of scale pattern, circuli count to first check or break, and scale and fish measurements. It was concluded that 30 of the 99 RT consisted of hatchery fish from the initial plant of 100,000 RT fingerlings April 1946; and that between 625 and 1,192 of the 2,980 fish checked were from this plant.

VESTAL, Elden H.

A New Transplant of the Piute Trout (*Salmo clarkii seleniris*) From Silver King Creek, Alpine County, California. Submitted September 15, 1946. 11 pp., 1 fig., appendix.

*Abstract:* Survey of the North Fork of Cottonwood Creek, in southeastern Mono County, revealed its possibilities for a new and remote sanctuary for the Piute trout, whose numbers have recently been reduced in its native Fish Valley, Alpine County, by poaching. During separate trips into Upper Fish Valley, Piute trout for a transplant were located and captured; and on August 23, 1946, 403 fish of all sizes (1¾ to 10 inches) were planted in a selected section of the North Fork of Cottonwood Creek. Recommendations for management of the sanctuary are given. In an appendix several recommendations are given for the management of Upper Fish Valley.

Report on Fertilization Test With Lower Virginia and Trumbull Lakes, Mono County, California. Submitted November 25, 1946. 11 pp., 4 tables.

*Abstract:* Lower Virginia Lake, of 12.3 acres located nine miles west of Conway Summit, California, at an elevation of 9,250 feet, was fertilized at the start of the growing season with 1,700 pounds of an 8-8-4 commercial fertilizer along with 6.41 liters of liquid trace elements. Trumbull Lake with similar characteristics and located 0.4 miles away, was not fertilized and was used for comparison in the fertilization test. At the end of the growing season there had been a greater growth and increase in plant life and plankton (by 26 times in volume of catch) in the fertilized lake.

Creel returns from Crowley Lake, Mono County, California, 1946. Submitted March 1, 1947. 7 pp., 1 fig., 2 tables.

*Abstract:* A creel count was made at Crowley Lake, which has a surface area of 5,284 acres and a maximum depth of 114 feet, by the Bureau of Patrol. During a season of 75 days, 13,181 anglers caught a total of 21,905 fish. Twenty thousand nine hundred eight (95.5 percent) were rainbow; 859 (3.9 percent) were brown trout, and 138 (0.6 percent) were Tahoe cutthroat. The total recorded catch weighed 33,242 pounds, indicating a yield of about 6.2 pounds per surface acre. The average catch per angler per hour for the season was 0.26. Recorded catch is estimated at little more than 50 percent of total.

Creel Returns From Crowley Lake, Mono County, California, 1947. Submitted September 1, 1947. 6 pp., 2 tables.

*Abstract:* A creel count at Crowley Lake was conducted by the Bureau of Patrol during the periods May 1-7 and July 2-7, 1947. During the 13 days of census 3,364 anglers fished 22,089 hours and caught 4,376 fish, including 4,143 rainbow (94.4 percent), 203 brown trout (4.6 percent), and 30 Tahoe cutthroat (less than 1 percent). Over a similar period of 13 days in 1946, 3,832 anglers fished 23,981 hours and caught 7,943 fish, including 7,495 rainbow (94.3 percent), 382 brown trout (4.8 percent), and 66 Tahoe cutthroat (less than 1 percent). Several recommendations are given for changes in fisheries management at Crowley Lake.

Report on the Creel Census at Rush Creek Test Stream, Mono County, California, 1947. Submitted November 15, 1947. 16 pp., 4 tables, 2 figs., 4 pls. (8 photos).

*Abstract:* Rush Creek Test Stream, 3.7 miles long, tributary to Mono Lake, was opened for creel survival studies on summer and late fall-planted catchable trout on May 1, 1947. Pre-census fish present in the stream were brown, rainbow, and eastern brook trout; no browns were planted after 1941 and the eastern brook have not been planted. From May 13 to August 4 five spaced summer test plantings were made in the stream of 2,000 catchable (average seven inches) rainbow trout each, all marked LV; on September 22d, the first winter carryover plant of 4,000 rainbow trout (average four and one-half inches) was made. Fish were of two groups, 2,000 each, from 1946-1947 fall-spawned eggs (marked Rv and AD) and from 1947 spring-spawned eggs (marked LV and AD). During the 1947 season of 184 days, 5,778 anglers fished 19,569 hours for 10,360 marked and unmarked trout. Marked 1947 planted fish contributed 87 percent of the catch. Out of the

FIGURE 23. Anglers on Rush Creek test stream, Mono County, May 2, 1948

10,000 LV trout planted, 8,881 (88.8 percent) were caught in 172 days of fishing; 7,020 of these were taken by July 31st. Unmarked fish contributed 13 percent of total catch for 1947; and 1,104 were browns, 214 rainbow, and 33 were eastern brook. Average catch per angler hour for the season was 0.52. Per mile use of the stream in 1947 is discussed.

Report of Aquatic Plant Control at Twin Lakes, Mammoth, Mono Co., California. Submitted December 8, 1947. 13 pp., 1 tbl., 6 figures (5 photos).

*Abstract:* The two lower Twin Lakes over a period of years had become obstructed by dense aquatic plant growth, chiefly *Anacharis*. The main portion of the center lake (12.7 acres) and the lower lake (9.4 acres) were each treated with 700 pounds of sodium arsenite, with 75 percent arsenious oxide, mixed with water and applied as spray. Effective initial concentration for the center lake was 2.6 p.p.m. and 4.0 p.p.m. for the lower lake. Collapse of plant growth reopened the entire 12.7 acres treated in the center lake nearly a month after treatment; and by onset of winter freezeover two and one-half weeks after treatment in the lower lake, 7.7 of the entire 9.4 acres had been reopened by similar collapse. Fish loss was negligible. Since sodium arsenite will not control or eliminate aquatic vegetation permanently, periodic treatment of the Twin Lakes, important for angling and recreation, may be necessary.

VESTAL, Elden H. and LEWIS, Robert C.

Report on Airplane Fish-planting Tests in Mono County, California. Submitted August 12, 1946. 8 pp.

*Abstract:* Using division plane, tests were conducted with CT 50-ounce, RT 10-ounce, 3-ounce, 6- to 8-pound, and with four brood fish from Hot Creek Hatchery. Fish were dumped directly, dropped in containers with and without lid, and in containers slung from a canopy cargo chute. Heights of release varied from 25 feet to 1,000 feet, with most drops from 300 to about 450 feet. The average speed of the plane was about 100 miles per hour. Drops were made in the morning from 7 to 11 a.m. Free-fall planting from 300 to 400 feet seemed to be the most successful in the direct release series. Fish from 50 to three ounces survived direct release better than larger fish used. EB responded better than RT. Fish not immediately stunned swam for cover or deep water; majority of fish stunned recovered in two to five minutes. Predation (gulls) was high in first five minutes after release. Fish planted by direct release of containers were mostly killed or injured. Chute method was most successful of all tried—fish arriving at impact area in excellent condition. Repetition of tests is recommended with plane adapted for purpose, since some mortality resulted from fish striking stabilizer and tail assembly of division plane.

Report on the Second Airplane Fish-planting Tests in Mono County, California. Submitted July 30, 1947. 8 pp., 1 table.

*Abstract:* The second series of airplane planting tests are described and planting notes and observations are presented and discussed. Free fall planting is considered to be the method of choice for practical fish planting in High Sierra lakes. It is recommended that the Bureau of Fish Conservation proceed to have designed and equipped a plane for fish planting in the High Sierras.

WALES, Joseph H.

Summary of Activities of the Fish Screen and Ladder Crew from January 1, to October 1, 1946. Submitted October 15, 1946. 5 pp.

*Abstract:* A statement of the present status of fish screens in Northern California is given. The difficulties of maintaining screens and the shortcomings of fish screens are outlined. A plan to reduce the number of screens to about 30 is proposed. These must be modern and will be frequently serviced. The present status and future plans for our Northern California fish ladders are outlined. Removal of abandoned dams and natural falls has important place. Projects for 1947 are listed.

Creel Census—May 1, 1947. McCloud River Mouth, Shasta County. Submitted May 31, 1947. 4 pp., 1 table.

*Abstract:* On May 1, 1947, a creel census was made at the mouth of the McCloud River (both in river and in Shasta Lake). Eighty-eight shore fishermen were counted and 14 contacted. Average catch per shore fisherman was 4.6 fish or 0.9 fish per hour. Average catch for boat fishermen was 1.5 fish or 0.3 fish per hour. These figures indicate a lower catch from the boats than in the two previous years but a larger shore catch. However, the fish caught from shore in 1947 were smaller than in 1945 and 1946. The trout catch for both shore and lake fishermen in 1947 showed no improvement over 1945 and 1946 but there was improvement in a much reduced number of rough fish. No cause can be found for the smaller catch of these squawfish and hardheads.

Castle Lake Trout Investigation; 1946 Catch, and Chemical Removal of all Fish. (Siskiyou County.) Submitted June 20, 1947. 21 pp., 14 tables, 1 figure.

*Abstract*: In 1946, 667 anglers caught 1,275 fish from Castle Lake (0.48 per hour or 1.9 per angler day). Twenty fishermen caught over 50 percent of all fish and 57 percent of anglers caught nothing. As in previous years the BN constituted over half the catch, RT less than one-fourth and even fewer EB despite nearly equal plants of all. Lake poisoned on October 9, 1946, and all fish possible were recovered and recorded. Numbers were as follows: BN, 2,027; EB, 364 (planted in 1946); EB, 50 (planted prior to 1946; RT, 44; mackinaw, 81; black dace, several thousand; golden shiners, several hundred. Small numbers of RT recovered probably due to fact that they were in deeper water when killed and could not be recovered. Fingerlings planted prior to poisoning then recovered yielded data on mortality during critical period. Mortality of all trout planted in lake during past nine years divided as follows: 90-97 percent due to natural causes, 3 to 10 percent caught by anglers. A new method of siphoning cube liquid into deep water is described.

Creel Censuses in District 1, May 1, 1948

1. McCloud River, Mouth, 3 pp.
2. Shasta River, 3 pp.
3. Klamath River, 5 pp.

Submitted May 13, 14, and 17, 1948.

*Abstract:* 1. Only 28 anglers fished here May 1st, probably due to weather and road conditions. Total catch: Five RT, one BN, one "pike." The average of 0.24 fish per hour is far lower than in any of the three preceding years. No marked RT from Almanor Hatchery in catch.

2. Open May 1st from mouth five miles up for first time in several years. Eighty-six (most of the) anglers checked, known to have caught 260 SH. Catch per hour 1.37 for lower half of section, 0.79 for upper. Size range four inches to 18 inches, with 92 percent from five inches to nine inches.

3. From Fall Creek to Scott River 108 anglers (a fairly complete check) had 135 SH and one probable salmon. 0.50 fish per hour from Shasta River to Fall Creek, 0.39 from Shasta River to Scott River. Size range four inches to 18 inches, with 84 percent five inches to nine inches.

WOODHULL, Chester

A Preliminary Investigation of the Mokelumne River from Tiger Creek to Pardee Reservoir. Submitted October 8, 1946. 14 pp. plus 1 map, 3 graphs and 9 photos.

*Abstract:* A summary of the proposed changes of the P. G. & E. hydro system; and a physical and biological survey of the river. A new plant will be constructed, the Electra Plant is to be enlarged and a tunnel system will replace the Electra canals. Regulating dams 18 to 22 feet high will be built at the plants. The mean flows needed by the plants exceed the mean stream flow. Because of the exposed character and low altitude of the river, a suggested minimum release of water is set at 15 c.f.s., to maintain this fine trout stream.

Spawning habits of the striped bass (*Roccus saxatilis*) in California waters. Submitted November 1946. 12 pp., 3 figures.

*Abstract:* Describes observations of spawning behavior of striped bass; collection of eggs; and data on location and conditions.

# REPORT OF THE BUREAU OF GAME CONSERVATION

The biennium of 1946-48 has seen several major changes in the Bureau of Game Conservation which we feel have resulted in providing better service to the sportsmen who harvest the game, and to the landowners who raise it.

A reevaluation of state game refuges has been made with the result that some which have outlived their purpose have been opened to hunting while there have been boundary changes in others. Some local opposition was met in 1947 but cooperative formulation of plans for the 1948 hunting season gives indications of harmony and a common purpose.

Among the more noteworthy of the changes in the bureau has been the absorption of the former Bureau of Game Farms.

## UPLAND GAME BIRD PRODUCTION

On July 1, 1946, the Bureau of Game Farms, for many years under the direction of August Bade (retired from state service in 1946), was dissolved and the work put under the direction of the Bureau of Game Conservation. Mr. Carlisle Van Ornum, Supervisor of Game Farms, has bent every effort to make the former Bureau of Game Farms fit into the

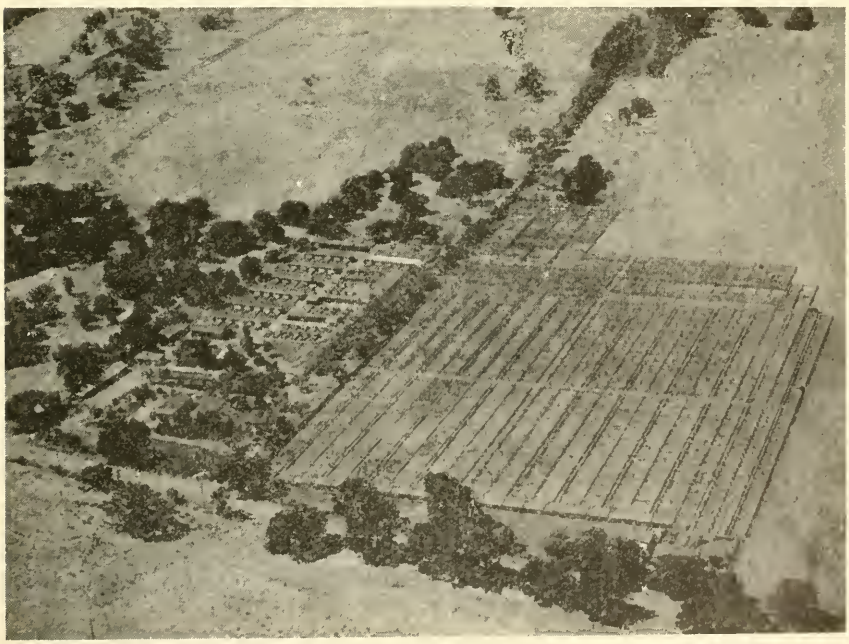


FIGURE 24. Aerial view of the Yountville Game Farm, heart of the division's game farm system, supplies eggs and young birds to other Bureau of Game Conservation installations and more than a score of sportsmen's club holding pens

present set-up in order that all agencies dealing with upland game birds will pursue a unified policy.

Several game farm units, authorized by the Legislature during the war years but uncompleted due to material shortages, were put into production. Among these were units at Marysville, Chico, Los Banos, Porterville, and Brawley.

During the years January 1, 1946, to December 31, 1947, the state units and sportsmen's pens raised and liberated 115,632 upland game birds. Of this number, 102,233 were ring-necked pheasants (38,697 were raised in sportsmen's pens), 1,278 were Reeves pheasants, 11,066 Chukar partridges, 702 valley quail and 353 wild stock turkeys. A summary of the liberation of game birds will be found in the appendix, page 106. Of the above pheasants, 30,546 were banded. Bands returned by hunters totaled 1,842, or 6.03 percent. About the same number of females were banded to facilitate the field study of this species.

As directed by the Fish and Game Commission, all Chukar partridges in Northern California game farm units were taken to Southern California in the early spring of 1947, and Chukar raising discontinued north of the Tehachapi Mountains. Several Chukar coveys are well established in Owens Valley, Inyo County.

In the spring of 1947 we sent to the State of Arizona 500 pheasant eggs and 200 Chukar partridge eggs for which we hope to get wild turkeys.

In the fall of 1946 a number of changes were made in the personnel of the production farms. The superintendent at Yountville was transferred to the division's headquarters in San Francisco, the superintendent at Chino was moved to Yountville, the superintendent at Fresno moved to Chino (the superintendent position being abolished at Fresno), and the foreman at Chino moved to Fresno. These necessary changes adversely affected our production temporarily in that the experienced men arriving at their new positions had to learn their districts, the men under them, and the peculiarities of the equipment they had to handle.

## GAME MANAGEMENT AREAS

The game management area plan, initiated in California by the 1939 State Legislature, was an effort to stimulate the landowner's interest in the game crop. It was intended to foster and increase the supply of upland game through private management of the land for game production, and by restocking with privately raised birds. This production of additional shooting is made economically possible by hunters of sufficient means paying extra for a longer season taking both sexes, and a bigger legal bag than it is possible to supply to the general hunting public.

During the 1946 season there were 10 operators who controlled 23,263 acres. These operators liberated 2,918 pheasants and 85 valley quail and killed 1,820 pheasants (927 males and 893 females) and 99 valley quail (61 males and 38 females).

As the valley quail were released in the spring, the operators were allowed to take more than they liberated. Hunting took up 1,021 man-days. The season was not particularly successful as all areas were commercial and the operators found it difficult to control the public on their land.

The following year the State Legislature modified the law and allowed noncommercial areas where the public was excluded. The number of commercial areas dropped to one and the noncommercial areas increased to 24. As noncommercial areas were limited to 2,500 acres the total acreage was not as large in proportion to the number of areas as in the previous year.

During the 1947 season there were 25 operators who controlled 32,828 acres. These operators liberated 7,337 pheasants and killed 3,896 (1,960 males and 1,936 females). We were able to inspect, check and control these areas much better in 1947 than in 1946 and found that 28 percent of the birds taken had game management area bands on their legs. Hunting took up 1,919 man-days.

The season was successful from the standpoint of the operators and their guests. Quite a number of areas were operated by hunting dog men for the purpose of training dogs and allowing dog owners to hunt and work their dogs. Of the 25 operators, only six shot over 90 percent of the allowable 70 percent of the birds liberated.

## PREDATOR CONTROL

During the biennium a grand total of 8,574 coyotes and 2,653 bobcats were taken by our predatory animal hunters and trappers.

A total of 4,943 other lesser predators were taken during the same period. A summary of the predators taken during the biennium will be found in the appendix, page 105.

## MOUNTAIN LION CONTROL

A total of 219 mountain lions were taken during the calendar year of 1946, and 195 in the calendar year of 1947 for a grand total of 414 mountain lions during this two-year period.

Of the 414, 99 were taken by state lion hunters and 315 were taken by private persons. It is pointed out that the state lion hunters operate where there have been complaints by stock ranchers and that they get into country that is generally inaccessible to the general public. A summary of the mountain lions taken from 1907 through 1947, inclusive, will be found in the appendix, between pages 104-105.

## GAME MANAGEMENT DISTRICTS

During the biennium this most important phase of habitat and game population control has been set up on a district basis. These districts and the corresponding game managers in charge are as follows: South Coast Counties, Mr. D. M. Selleck; Southern California, Mr. J. Laughlin; Northeastern California, Mr. J. D. Stokes; Central Valley,

Mr. L. H. Cloyd. It is the responsibility of each game manager to investigate game problems and apply corrective measures within his district and to administer bureau installations. Work being accomplished includes depredation control in conjunction with the Bureau of Patrol; operation of winter deer ranges, elk refuge, waterfowl refuges, and waterfowl management areas; trapping and transplanting upland and big game; inspection of game management area operations; development of quail and other upland game habitat. Game Manager R. E. Curtis acts in a supervisory and advisory capacity to the district game managers, integrating their efforts into a common program.

## CALIFORNIA FISH AND GAME LANDS
### (Other Than Game Farms)

Tehama Deer Winter Range with 28,589.60 acres (additional purchases pending) was purchased from 1943 to 1948, inclusive, to protect the winter range from natural food depletion by heavy stock-grazing.

Doyle Deer Winter Range with 11,700 acres was purchased in 1948.

Honey Lake Waterfowl Management Area (including Biscar Reservoir) with 3,519.70 acres was purchased from 1942 to 1944, inclusive.

Imperial Waterfowl Management Area with 535.24 acres (additional purchase pending) was purchased in 1948.

Madeline Plains Waterfowl Management Area with 4,776.10 acres was purchased in 1945-46.

Gray Lodge Waterfowl Refuge with 2,541.51 acres was purchased in 1931-32.

Imperial Waterfowl Refuge with 2,064.43 acres was purchased in 1931-32.

Los Banos Waterfowl Refuge with 3,000.00 acres was purchased in 1929.

Suisun Waterfowl Refuge with 1,887.00 acres was purchased in 1932.

## FEDERAL AID IN WILDLIFE RESTORATION
### (PITTMAN-ROBERTSON)

This program has expanded greatly during the biennium and the return to the sportsman and game administrator is and shall continue to be of practical usability. Although some equipment and materials were still scarce, surveys and investigations, development, and land acquisitions proceeded at an accelerated rate.

For the fiscal year, 1946-47, California received a federal aid in wildlife restoration apportionment of $103,132.34 and for the year 1947-48, $374,283.09. California's contribution, as required by the act, brought the total available for expenditure during the biennium to $636,453.91.

A total of 14 projects was in operation during all or part of the biennium. Of these, eight were of the surveys and investigations category, three were development projects, two provided for the acquisition of

lands, and one coordination project facilitated land acquisition and coordinated the efforts of the state departments concerned. Following is an account of the various projects which have been undertaken:

*Surveys and Investigations*

Project 24-R, a survey of reported critical deer ranges in California, was begun in 1946 and completed June 30, 1947. The final report was completed and submitted to the U. S. Fish and Wildlife Service. The results of this study are being utilized by the present Project 28-R. The project was initially led by Mr. J. F. Ashley, who was transferred to other duties in 1946. The survey was then taken over and carried to completion by Mr. H. A. Hjersman.

Project 19-R, the study of the life history and management of mountain quail in California, began in 1946 and is being continued. This project was led by Mr. R. W. Enderlin, who resigned in 1947. The leader since that time has been Mr. E. V. Miller.

Project 20-R, a survey of waterfowl food plants of California, began in 1946 and is being conducted under contract with the University of California. The leader is Dr. H. L. Mason, University Herbarium.

Project 22-R, the life history and management of the ring-necked pheasant in California, began in 1945 and is begin continued. This project has been led by Mr. F. M. Craig (resigned, 1946) and Mr. H. W. Twining (resigned, 1948). The present project leader is Mr. C. M. Ferrel.

Project 25-R, a study of the food habits of California game birds and mammals and species affecting their welfare, began in 1946 and is being continued. The project leader is Mr. D. F. Tillotson.

Project 28-R, a study of deer population and management problems in California, began in 1947 and is being conducted under contract with the University of California. The leader is Dr. A. S. Leopold of the University Museum of Vertebrate Zoology.

Project 30-R, a study of production, migration, and wintering areas of waterfowl in California, began in 1948 and is continuing under the leadership of Mr. J. E. Chattin.

Project 31-R, a study of the effects of brush removal on game ranges in California, began in the latter portion of the biennium and is being conducted under contract with the University of California under the leadership of Dr. H. A. Biswell of the School of Forestry.

*Development Projects*

Project 18-D, the live-trapping and transplanting of beaver, commenced in May, 1945, was still in operation at the close of this biennium. One additional trapping and transplanting crew was added in 1948 and, to date, the two crews have trapped and liberated 337 beaver at 84 locations. This species is proving popular with forest officials and others desirous of improving stream habitat and grazing lands. The project leader is Mr. A. L. Hensley.

Project 27-D involved the repair of Tule Lake Dam and construction of diversion works to provide water for the ponds of the Madeline Plains Waterfowl Management Area. The work was performed and completed

during the fall and winter of 1946-47 by the Division of Water Resources, Department of Public Works, for the Division of Fish and Game.

Project 26-D, working on the restoration of the various species of quail in California, represents the major effort in habitat development. This program has developed as a result of experimental work performed by project 6-R. During the biennium about 150 "gallinaceous guzzlers," or rain catchment aprons with underground cisterns and access ramps, were constructed primarily to provide water for thirsty quail. Many acres of habitat unsuitable because of lack of water are now producing thousands of additional quail for California's hunters. Much of this construction received financial aid from county fine moneys and physical aid from sportsmen and other interested persons.

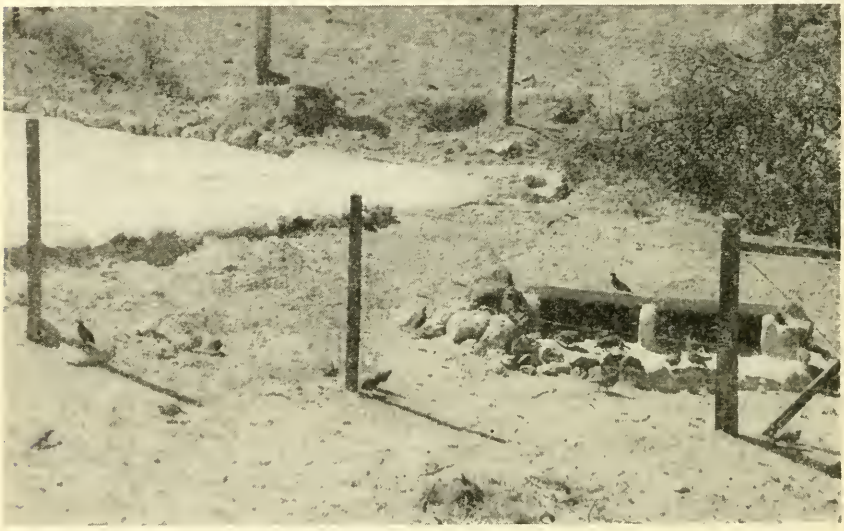


FIGURE 25. View of "gallinaceous guzzler" showing use by valley quail (San Benito County)

The majority of this work was accomplished by one crew under the leadership of Mr. F. T. Ross. At the close of the biennium three separate "guzzler" crews were operating with one additional crew authorized. These watering devices were being produced at the rate of 15 to 20 each month.

## DISEASE LABORATORY

The disease laboratory, a bureau function located in Strawberry Canyon on the campus of the University of California in Berkeley, has expanded its program but the working space is inadequate. Under the direction of Dr. C. M. Herman the staff discovered pullorum, a serious intestinal disease, among the state game farm pheasants in the spring of 1947. That fall an extensive control program was initiated with the result that the disease was eradicated. An outbreak of infectious coryza was found in one of the game farm units and the disease was eradicated.

FIGURE 26. The recently acquired mobile wildlife laboratory operated by the Bureau of Game Conservation is equipped for on-the-spot investigations and autopsies in the field. Speedy diagnosis of wildlife diseases enables the division to inaugurate control measures without delay

Investigation of reported hoof and mouth disease in deer in several local outbreaks disclosed the disease to be foot-rot. Work on this is being continued as cases occur. This was an infection caused by anaerobic bacteria produced in waterholes which were at a low level because of scant rainfall.

Many other studies were in progress at the close of the biennium and outbreaks of game diseases were investigated both in the field and the laboratory upon their occurrence.

## BEAVER TRAPPING

Owing to the increase of the beaver population in the delta area of the Sacramento and San Joaquin Rivers, an area in excess of 1,500 miles of waterways was opened to the commercial trapping of beaver from November 15, 1947, until the last day of February, 1948. One hundred nineteen special permits were issued to licensed trappers of which 86 participated. The revenue received by the trappers for 842 of the 975 beaver trapped was $14,270, or an average of $16.95 per pelt. This is one example of the long-range management plan of the bureau in harvesting the surplus over and above the balance between population and habitat.

FIGURE 27. View of beaver dam established by transplanted beavers (Tuolumne County)

## BIG GAME TRAPPING

The biennium has experienced an expanded program of manipulation of big game populations. In an attempt to create new centers of game populations for eventual harvesting by sportsmen in presently unoccupied habitat, requests for moving big game were made by sportsmen, the Division of Parks, and the Fish and Game Commission. Although this management tool is relatively new in California and the procedure expensive, the following trapping and transplanting was accomplished:

Antelope—38 head were trapped at Mud Flat, Lassen County, of which 32 survived the transport, and were liberated near Mono Lake, Mono County, in 1947.

Elk—17 head were trapped at the Prairie Creek Redwoods State Park near Orick, Humboldt County, and were liberated in Bear Valley, Del Norte County, in 1947.

Deer—About 40 head were trapped in Capay Valley, Yolo County, and liberated in the Livermore Hills area in several counties.

One of the lengthiest hauls of trapped deer in history involved the movement of 49 deer from Lassen County to the Providence Mountains of San Bernardino County.

# REPORT OF BUREAU OF LICENSES

As the Division of Fish and Game is a self-supporting state agency, the responsibility of the Bureau of Licenses is to manage the printing and distribution of licenses as well as collecting all moneys received from the sale of licenses. In all there are 19 kinds of licenses bringing a yearly revenue of approximately $4,589,900. The principal licenses are: Hunting, angling, deer tags, and market fishermen.

As the law provides that a license is required to hunt or fish, the bureau maintains approximately 2,800 agencies throughout the State so that the sportsmen may purchase their licenses as conveniently as possible.

For the purpose of license management and distribution the State is divided into five districts, each district office maintaining the necessary records to enable them to control the distribution and sale of licenses to the agents within their respective districts. Branch district offices are maintained at Redding, Sacramento, San Francisco, Fresno and Los Angeles.

All license distribution is conducted on a consignment basis, the agent being bonded in an amount sufficient to cover his accountability at any one time. During the last seven-year period the bond premiums have been reduced from $5 to $1.75 per 1,000. This reduction in the premium rate is the result of close supervision of our license agents' accounts and keeping the losses or claims filed with the bonding company to a bare minimum. During this seven-year period the bonding company has paid seven claims, totaling $561.63. The license sales accounted for during this period amounted to $14,587,000.

The law placing all license distribution on a credit basis, which went into effect in January, 1946, has proved very satisfactory and has eliminated any shortages in the field. During the biennium several changes were made in the license laws, establishing certain new licenses and changing the fees of other licenses. In 1946 the "Archery Hunting and Archery Deer Tag Law" became effective.

The sale of archery licenses and tags for the years 1946 and 1947 are as follows:

*Archery*

| *Year* | *Hunting* | *Deer tags* |
|---|---|---|
| 1946 | $663 | $604 |
| 1947 | 681 | 590 |

Other changes in the license fees are as follows:

*Hunting*

| | *Old fee* | *New fee* |
|---|---|---|
| Citizen resident | $2 | $3 |
| Junior citizen | 1 over 18 years | 1 over 16 years |
| Nonresident | 10 | 10 minimum reciprocal |
| Declarant alien | 10 | Abolished |
| Alien | 25 | 50 |
| Veteran's wife | None | 2 |

### *Angling*

| | *Old fee* | *New fee* |
|---|---|---|
| Citizen resident | $2 over 18 years | $3 over 16 years |
| Junior citizen | None under 18 years | None under 16 years |
| Nonresident | 3 | 5 minimum reciprocal |
| Alien | 5 | 25 |

## DEER MEAT PERMITS

All persons retaining deer meat in their possession after the regular 15-day period following the close of deer season are required to have the meat stamped. The fee for stamping and retaining the deer meat is $1. Deer meat permits, stamps, etc., are furnished to all locker plants and other places where deer meat may be kept. These places of business stamp the meat and are permitted to retain 50 cents for their services, and account to the Division of Fish and Game for the other 50 cents. The revenue for the years of 1946 and 1947 was as follows:

| | |
|---|---|
| 1946 | $11,881 |
| 1947 | 11,965 |

The Fish Packer's and Shellfish Dealer's License Act was amended in 1947. As amended the new act provides that all dealers in fresh fish are required to be licensed. This new law went into effect on September 19, 1947.

License agents are now permitted by law to retain their 5 pereent compensation at the time of remitting for license sales. This change provides the immediate payment of his commission to the agent, and eliminates considerable work in the departmental accounting office, State Controller's Office, and State Treasurer's Office.

The sale of hunting licenses, angling licenses, and deer tags has shown a large increase during the past 10 years. The following tables show the increase each year:

### *Hunting*

| *Year* | *Value* | *Number* | *Year* | *Value* | *Number* |
|---|---|---|---|---|---|
| 1938-39 | $487,763 50 | 252,117 | 1943-44 | $557,254 00 | 284,370 |
| 1939-40 | 528,952 00 | 270,095 | 1944-45 | 626,634 00 | 318,910 |
| 1940-41 | 565,395 00 | 291,507 | 1945-46 | 780,106 50 | 393,282 |
| 1941-42 | 643,700 00 | 331,878 | 1946-47 | 965,916 00 | 487,307 |
| 1942-43 | 522,985 00 | 268,128 | 1947-48 | 1,016,600 50 | 507,068 |

### *Angling*

| *Year* | *Value* | *Number* | *Year* | *Value* | *Number* |
|---|---|---|---|---|---|
| 1938 | $705,611 00 | 348,227 | 1943 | $899,782 00 | 447,352 |
| 1939 | 746,061 00 | 366,452 | 1944 | 883,841 00 | 436,940 |
| 1940 | 791,472 00 | 390,342 | 1945 | 1,120,661 50 | 557,536 |
| 1941 | 933,586 00 | 460,715 | 1946 | 1,553,706 00 | 768,816 |
| 1942 | 876,003 00 | 433,431 | 1947 | 1,793,368 50 | 884,772 |

### *Deer Tags*

| *Year* | *Value* | *Number* | *Year* | *Value* | *Number* |
|---|---|---|---|---|---|
| 1938 | $141,598 00 | ---- | 1943 | $147,795 00 | ---- |
| 1939 | 152,924 00 | ---- | 1944 | 178,250 00 | ---- |
| 1940 | 163,285 00 | ---- | 1945 | 214,662 00 | ---- |
| 1941 | 173,699 00 | ---- | 1946 | 282,060 00 | ---- |
| 1942 | 116,121 00 | ---- | 1947 | 299,610 00 | ---- |

It will be noted that during the war years, particularly 1942, 1943, and 1944, the sales fell off somewhat. This was caused by wartime regulations. However, since 1938 the number of hunters and fishermen has increased as follows:

| | |
|---|---|
| Hunting | 101% |
| Angling | 154% |
| Deer Tag | 112% |

# APPENDIX

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT

### For the Period July 1, 1946, to June 30, 1947

### (Ninety-eighth Fiscal Year)

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Administration—101 | | | | |
| Seasonal employees | $2,720 00 | | | $2,720 00 |
| Regular employees | 44,121 27 | | | 44,121 27 |
| Accident and death claims | | $10,485 69 | | 10,485 69 |
| Automobile | | 7,975 93 | $2,646 89 | 10,622 82 |
| Educational | | 95 01 | | 95 01 |
| Exhibits | | 46 45 | | 46 45 |
| Freight, cartage and express | | 1,993 98 | | 1,993 98 |
| Legal advertising | | 1,601 86 | | 1,601 86 |
| Library | | 365 42 | 832 56 | 1,197 98 |
| Light, heat and power | | 1,845 68 | | 1,845 68 |
| Office | | 8,987 72 | 869 42 | 9,857 14 |
| Photography | | 10,740 14 | 658 19 | 11,398 33 |
| Postage | | 7,371 09 | | 7,371 09 |
| Premium on bonds | | 54 00 | | 54 00 |
| Printing, general | | 6,844 61 | | 6,844 61 |
| Printing fish and game magazine | | 2,394 60 | | 2,394 60 |
| Pro rata, attorney general services | | 6,000 00 | | 6,000 00 |
| Pro rata, departmental administration | | 44,451 37 | | 44,451 37 |
| Pro rata, general fiscal administration | | 29,119 63 | | 29,119 63 |
| Pro rata, Personnel Board services | | 11,454 90 | | 11,454 90 |
| Rent | | 11,724 94 | | 11,724 94 |
| Telephone and telegraph | | 10,491 01 | | 10,491 01 |
| Travel | | 9,647 92 | | 9,647 92 |
| Total Administration | $46,841 27 | $183,691 95 | $5,007 06 | $235,540 28 |
| Patrol and Law Enforcement—104 | | | | |
| Cannery inspection | $8,712 06 | | | $8,712 06 |
| Executive | 32,315 13 | | | 32,315 13 |
| Land patrol | 392,925 56 | | | 392,925 56 |
| Marine patrol | 111,173 03 | | | 111,173 03 |
| Office | 45,936 32 | | | 45,936 32 |
| Airplane | | $2,383 57 | $3,254 71 | 5,638 28 |
| Automobile | | 97,077 32 | 83,085 69 | 180,163 01 |
| Boats | | 15,088 60 | 30,209 48 | 45,298 08 |
| Field | | 2,534 37 | 7,683 21 | 10,217 58 |
| Freight, cartage and express | | 191 89 | | 191 89 |
| Light, heat and power | | 109 21 | 9 18 | 118 39 |
| Office | | 690 95 | 2,136 25 | 2,827 20 |
| Postage | | 265 50 | | 265 50 |
| Premium on bonds | | 2,530 04 | | 2,530 04 |
| Printing | | 1,213 54 | | 1,213 54 |
| Rent | | 9,382 93 | | 9,382 93 |
| Telephone and telegraph | | 11,438 65 | | 11,438 65 |
| Travel | | 105,996 33 | | 105,996 33 |
| Radio | | | 9,212 94 | 9,212 94 |
| Total Patrol and Law Enforcement | $591,062 10 | $248,902 90 | $135,591 46 | $975,556 46 |
| Marine Fisheries—105 | | | | |
| Central Valley water project and salmon study | $33,808 39 | | | $33,808 39 |
| Executive | 10,727 00 | | | 10,727 00 |
| Laboratory | 10,950 80 | | | 10,950 80 |
| Library | 2,101 53 | | | 2,101 53 |
| Office | 12,637 79 | | | 12,637 79 |
| Scientific investigation | 28,573 55 | $4,522 29 | $3,357 11 | 36,452 95 |
| Statistics | 36,553 19 | 1,495 13 | 459 88 | 38,508 20 |
| Automobile | | 5,652 07 | 9,635 81 | 15,287 88 |
| Cooperative research | | 16 58 | | 16 58 |
| Fish cannery auditing | | 5,573 34 | | 5,573 34 |
| Fish specimens and tagged fish | | 201 78 | | 201 78 |
| Fish tags | | 947 06 | | 947 06 |
| Laboratory | | 1,156 15 | 317 89 | 1,474 04 |
| Library | | 221 95 | 339 05 | 561 00 |
| Light, heat and power | | 664 65 | | 664 65 |
| Office | | 454 90 | 510 39 | 965 29 |
| Postage | | 849 39 | | 849 39 |
| Printing | | 4,493 57 | | 4,493 57 |
| Freight, cartage and express | | 1,254 97 | | 1,254 97 |
| Rent | | 6,129 63 | | 6,129 63 |
| Telephone and telegraph | | 323 01 | | 323 01 |
| Travel | | 13,405 77 | | 13,405 77 |
| Total Marine Fisheries | $135,352 25 | $47,362 24 | $14,620 13 | $197,334 62 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1946, to June 30, 1947

### (Ninety-eighth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Fish Conservation—106 | | | | |
| Biological survey | $39,401 03 | | | $39,401 03 |
| Executive | 17,336 50 | | | 17,336 50 |
| Field supervision | 28,379 75 | | | 28,379 75 |
| Fish rescue | 8,869 21 | | | 8,869 21 |
| Office | 10,943 66 | | | 10,943 66 |
| Pollution inspection | 3,499 99 | | | 3,499 99 |
| Stream improvements | 6,196 15 | | | 6,196 15 |
| Basin Creek | 7,704 60 | | | 7,704 60 |
| Benbow Dam | 2,065 30 | | | 2,065 30 |
| Brookdale | 8,016 82 | | | 8,016 82 |
| Burney | 8,665 41 | | | 8,665 41 |
| Central Valley | 10,602 12 | | | 10,602 12 |
| Coy Flat | 116 24 | | | 116 24 |
| Fall Creek Hatchery | 6,770 14 | | | 6,770 14 |
| Feather River | 6,388 64 | | | 6,388 64 |
| Fillmore Hatchery | 27,576 20 | | | 27,576 20 |
| Hot Creek Hatchery | 21,243 46 | | | 21,243 46 |
| Huntington Lake | 333 13 | | | 333 13 |
| June Lake Egg Collecting Station | 198 38 | | | 198 38 |
| Kaweah Hatchery | 7,324 96 | | | 7,324 96 |
| Kern Hatchery | 3,674 91 | | | 3,674 91 |
| Kings River Hatchery | 8,028 55 | | | 8,028 55 |
| Lake Almanor Hatchery | 10,216 57 | | | 10,216 57 |
| Mad River Egg Collecting Station | 1,055 47 | | | 1,055 47 |
| Mojave River Hatchery | 1,271 00 | | | 1,271 00 |
| Mt. Shasta Hatchery | 61,796 62 | | | 61,796 62 |
| Mt. Tallac Hatchery | 5,152 11 | | | 5,152 11 |
| Mt. Whitney | 30,738 20 | | | 30,738 20 |
| Prairie Creek Hatchery | 8,024 23 | | | 8,024 23 |
| Sequoia Hatchery | 5,939 36 | | | 5,939 36 |
| Shasta River Hatchery | 488 57 | | | 488 57 |
| Snow Mountain | 1,038 87 | | | 1,038 87 |
| Tahoe Hatchery | 7,667 40 | | | 7,667 40 |
| Tuolumne | 858 67 | | | 858 67 |
| Whittier Hatchery | 10,872 28 | | | 10,872 28 |
| Yosemite Hatchery | 6,779 86 | | | 6,779 86 |
| Yuba River Hatchery | 4,352 28 | | | 4,352 28 |
| Automobile | | $37,656 19 | $49,894 97 | 87,551 16 |
| Chemicals | | 4,832 52 | | 4,832 52 |
| Eyed eggs | | 1,546 81 | | 1,546 81 |
| Field operating supplies | | 11,403 71 | 2,553 32 | 13,957 03 |
| Fish foods | | 155,439 97 | | 155,439 97 |
| Freight, cartage and express | | 8,338 58 | | 8,338 58 |
| Fuel | | 3,762 76 | | 3,762 76 |
| Ice | | 3,590 73 | | 3,590 73 |
| Light, heat and power | | 11,524 19 | | 11,524 19 |
| Office | | 662 80 | 25 16 | 687 96 |
| Operating expenses | | 114 89 | 21,836 46 | 21,951 35 |
| Operating service | | 187 86 | | 187 86 |
| Postage | | 481 24 | | 481 24 |
| Printing | | 1,045 75 | | 1,045 75 |
| Rent | | 22,672 08 | | 22,672 08 |
| Structural maintenance | | 7,669 45 | 923 49 | 8,592 94 |
| Telephone and telegraph | | 2,130 25 | | 2,130 25 |
| Travel | | 23,463 48 | | 23,463 48 |
| Statistics | | | 16 37 | 16 37 |
| Total Fish Conservation | $389,586 64 | $296,523 26 | $75,249 77 | $761,359 67 |
| Game Conservation—108 | | | | |
| Brawley Game Farm | $964 44 | | | $964 44 |
| Castaic Farm | 2,708 64 | | | 2,708 64 |
| Elk Refuge | 3,057 48 | | | 3,057 48 |
| Executive | 15,876 93 | | | 15,876 93 |
| Fresno Game Farm | 9,467 40 | | | 9,467 40 |
| Game bird district—Los Serranos | 410 40 | | | 410 40 |
| Game management | 47,242 21 | | | 47,242 21 |
| Gray Lodge Refuge | 8,478 16 | | | 8,478 16 |
| Honey Lake Refuge | 9,050 76 | | | 9,050 76 |
| Imperial Refuge | 5,037 66 | | | 5,037 66 |
| Los Banos Refuge | 5,786 64 | | | 5,786 64 |
| Los Serranos Game Farm | 19,406 63 | | | 19,406 63 |
| Porterville Game Farm | 1,661 44 | | | 1,661 44 |
| Predatory animal lion hunting | 12,976 72 | | | 12,976 72 |
| Predatory animal trapping | 76,497 23 | | | 76,497 23 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1946, to June 30, 1947

### (Ninety-eighth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Game Conservation—108—Continued | | | | |
| Redding Game Farm | $5,261 90 | | | $5,261 90 |
| Research | 15,778 88 | | | 15,778 88 |
| Sacramento Game Farm | 5,182 28 | | | 5,182 28 |
| Suisun Refuge | 4,642 72 | | | 4,642 72 |
| Valley Center | 1,959 66 | | | 1,959 66 |
| Visalia | 318 06 | | | 318 06 |
| Willows Game Farm | 3,264 01 | | | 3,264 01 |
| Yountville boarding house | 2,133 07 | | | 2,133 07 |
| Yountville Game Farm | 35,278 38 | | | 35,278 38 |
| Airplane rental | | $9 99 | | 9 99 |
| Automobile | | 47,034 11 | $43,014 24 | 90,048 35 |
| Bounties | | 11,538 60 | | 11,538 60 |
| Cooperating in game management school | | 187 70 | 40 79 | 228 49 |
| Field | | 33,020 61 | 1,851 50 | 34,872 11 |
| Game foods | | 25,225 34 | | 25,225 34 |
| Freight, cartage and express | | 118 76 | | 118 76 |
| Laboratory | | 3,177 27 | 1,771 48 | 4,948 75 |
| Light, heat and power | | 7,758 81 | | 7,758 81 |
| Office | 10,004 76 | 443 21 | 794 19 | 11,242 16 |
| Postage | | 174 00 | | 174 00 |
| Printing | | 1,167 20 | | 1,167 20 |
| Rent | | 4,709 69 | | 4,709 69 |
| Statistics | | 1,381 88 | | 1,381 88 |
| Telephone and telegraph | | 1,200 09 | | 1,200 09 |
| Travel | | 27,311 09 | | 27,311 09 |
| Total Game Conservation | $302,446 46 | $164,458 35 | $47,472 20 | $514,377 01 |
| Licenses—111 | | | | |
| Executive | $9,336 00 | | | $9,336 00 |
| License distribution | 24,332 79 | | | 24,332 79 |
| Automobile | | $1,023 37 | $900 21 | 1,923 58 |
| Freight, cartage and express | | 2,318 42 | | 2,318 42 |
| License commissions—credit agents | | 150,453 85 | | 150,453 85 |
| License commissions—cash agents | | 439 21 | | 439 21 |
| Office | 2,600 90 | 524 95 | 1,192 27 | 4,318 12 |
| Postage | | 6,675 78 | | 6,675 78 |
| Premium on bonds | | 7,245 15 | | 7,245 15 |
| Printing | | 42,901 11 | | 42,901 11 |
| Rent | | 780 00 | | 780 00 |
| Telephone and telegraph | | 248 55 | | 248 55 |
| Travel | | 1,630 71 | | 1,630 71 |
| Total Licenses | $36,269 69 | $214,241 10 | $2,092 48 | $252,603 27 |
| Construction of Fish Screens and Stream Improvements | | | | |
| Total Fish Screens | | $4,402 80 | | $4,402 80 |
| Total Fish and Game Support—Ninety-eighth Fiscal Year | | | | $2,941,174 11 |
| Less estimated maintenance deductions | | | | 13,312 92 |
| Net total for support—Ninety-eighth Fiscal Year | | | | $2,927,861 19 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1946, to June 30, 1947

### (Ninety-eighth Fiscal Year)—Continued

| Function | Detail | Total |
|---|---|---|
| Additions and Betterments | | |
| Purchase of land | | |
| Appraisal of the Welch tract in Colusa County | $323 69 | |
| Acquisition, establishment and maintenance of fish hatcheries (chapter 1439-45) | | |
| Los Angeles County | 7,694 23 | |
| San Bernardino County | 23,684 12 | |
| Total Land | | $31,702 04 |
| Improvements | | |
| Alterations to botanical gardens building, Game Conservation— | | |
| Research laboratory | $3,050 29 | |
| Alterations and modernization of hatchery buildings | 8,192 85 | |
| Brooder houses and pens: | | |
| Redding game farm | 35 63 | |
| Sacramento game farm | 132 41 | |
| Yountville game farm (chapter 644-45) | 4,647 05 | |
| Yountville game farm (chapter 106-46) | 71 76 | |
| Brookdale hatchery—propane installations | 1,128 00 | |
| Central Valley hatchery | 682 78 | |
| Coast counties quail project—warehouse | 1,363 17 | |
| Construction of rearing ponds (all hatcheries) | 127 55 | |
| Construction and equipment of workman shop and warehouse at Yreka | 3,763 73 | |
| Construction of salmon traps in Central Valley and Trinity River watersheds | 1,680 68 | |
| Crystal Lake hatchery | 117,503 54 | |
| Crystal Lake hatchery—cattle guard fence | 11,000 00 | |
| Engineering project | 10,000 00 | |
| Experimental electrical and mechanical fish screens | 9,789 94 | |
| Fern Creek—house and garage remodeling project | 119 21 | |
| Fish ladders and dams: | | |
| Clough Dam on Mill Creek | 8,000 00 | |
| Woodbridge Dam | 65,400 00 | |
| Game refuges (miscellaneous) | 6,354 01 | |
| Game farms (miscellaneous) | 4,248 93 | |
| Hot Creek hatchery | 3,699 50 | |
| Honey Lake refuge | 597 14 | |
| Imperial public shooting grounds | 1,633 83 | |
| Improvements of game farms: | | |
| Brawley | 5,481 32 | |
| Chico | 5,649 18 | |
| Marysville | 4,509 71 | |
| Porterville | 8,459 63 | |
| Improvements to Tule Lake and Madeline reservoirs | 10,615 38 | |
| Kern hatchery—drilling of well | 461 79 | |
| Kern hatchery | 1,410 81 | |
| Mt. Tallac hatchery | 63 88 | |
| Mt. Whitney hatchery—wire installations | 850 00 | |
| Tahoe hatchery—new construction | 4,317 23 | |
| Prairie Creek hatchery—propane installation | 1,955 19 | |
| Redding game farm—cottage and garage | 5,644 39 | |
| Redding warehouse | 483 36 | |
| Refrigeration facilities: | | |
| Central Valley hatchery | 5,271 87 | |
| Crystal Lake hatchery | 2,727 81 | |
| Fillmore hatchery | 2,559 04 | |
| Kern hatchery | 2,621 54 | |
| Mt. Whitney hatchery | 5,382 14 | |
| Sequoia hatchery | 2,660 40 | |
| Remodeling of living quarters: | | |
| Fresno game farm | 501 23 | |
| Sacramento game farm | 52 10 | |
| Replacement of pipe lines (all hatcheries) | 794 17 | |
| Tahoe hatchery (miscellaneous) | 371 93 | |
| Tehama winter range | 8,452 91 | |
| Terminal Island laboratory | 4,500 00 | |
| Terminal Island parking area—paving | 760 00 | |
| Tuna fisheries research facilities | 640 63 | |
| Total Improvements | | $350,419 64 |
| Total Additions and Betterments | | $382,121 68 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1946, to June 30, 1947

### (Ninety-eighth Fiscal Year)—Continued

| Function | Detail | Total |
|---|---|---|
| Cooperation with Federal Government—Pittman-Robertson Act | | |
| Beaver transplanting state-wide | $4,821 82 | |
| Restoration of valley quail in south coast ranges of California | 20,323 50 | |
| Repair of Tule Lake Reservoir Dam (Part 1, all) and Tule Lake Reservoir Diversion Works (Part 2, segment 1) | 62,265 00 | |
| Madeline Plains waterfowl management area | 1,440 00 | |
| Desert game water development survey | 334 18 | |
| Life history and management of mountain quail in California | 13,212 70 | |
| Survey of the waterfowl food plants of California | 2,450 81 | |
| Life history and management of the ring-necked pheasant in California | 12,831 08 | |
| Survey of critical summer and winter deer ranges of California | 6,811 59 | |
| Study of food habits of the mountain quail, ring-necked pheasant and coyote of California | 10,822 22 | |
| Total Pittman-Robertson Act | | $135,312 90 |
| Less individual abatement from Federal Government pro rata share Pittman-Robertson Act | | 70,262 14 |
| Net total Pittman-Robertson Ninety-eighth Fiscal Year | | $65,050 76 |
| State apportionment: Madeline Plains waterfowl management area Preliminary engineering survey (Tule Lake dam) | | 1,500 00 |
| Contributed to Employees Retirement Fund | | 129,361 55 |
| Grand total Fish and Game Preservation Fund—Ninety-eighth Fiscal Year | | $3,505,895 18 |

## STATEMENT OF REVENUE

### For the Period July 1, 1946, to June 30, 1947

### (Ninety-eighth Fiscal Year)

| | Detail | Total |
|---|---|---|
| Revenue for Fish and Game Preservation Fund: | | |
| 1946 series | | |
| Archery deer tags | $604 00 | |
| Deer tags | 282,053 00 | |
| Total deer tags | | $282,657 00 |
| Fish tags | $2,569 89 | |
| Game tags | 369 51 | |
| Market fishermen | 50,090 00 | |
| Fish importers | 10 00 | |
| Fish party boat permits | 153 00 | |
| Fish breeder | 75 00 | |
| Game breeder | 190 00 | |
| Kelp license | 10 00 | |
| Game management area licenses | 10 00 | |
| Game management area tags | 53 73 | |
| Deer meat agents—locker permits | 11,285 00 | |
| Deer meat agents—wardens | 596 00 | |
| Total 1946 series | | $2,120,599 63 |
| 1945 series | | |
| Angling | | |
| Citizen | $5,028 00 | |
| Non-resident (Debit) | 3 00 | |
| Duplicate | 3 50 | |
| Total angling | | $5,028 50 |
| Hunting | | |
| Citizen | $17,454 00 | |
| Junior | 1,198 00 | |
| Non-resident | 120 00 | |
| Declarant alien | 20 00 | |
| Duplicate | 68 50 | |
| Total hunting | | $18,860 50 |
| Deer tags | $23 00 | |
| Fish tags | 83 01 | |
| Game breeder | 90 00 | |
| Kelp license (Debit) | 70 00 | |
| Game management area licenses (Debit) | 20 00 | |
| Deer meat agents—locker permits | 12 50 | |
| Total 1945 series | | $24,007 51 |
| Other revenue | | |
| Court fines | $110,058 64 | |
| Lease of kelp beds | 52 80 | |
| Fish packers tax | 218,534 03 | |
| Kelp tax | 3,154 16 | |
| Salmon tax | 43,618 85 | |
| Miscellaneous | 32,333 56 | |
| Interest on Surplus Money Investment Fund | 1,429 37 | |
| March court fines | 79 | |
| Total other revenue | | $409,182 20 |
| Grand total Fish and Game Preservation Fund | | $3,556,426 26 |

## STATEMENT OF REVENUE—Continued

### For the Period July 1, 1946, to June 30, 1947

### (Ninety-eighth Fiscal Year)—Continued

| | Detail | Total |
|---|---|---|
| Revenue for Fish and Game Preservation Fund: | | |
| 1947 series | | |
| Angling | | |
| Citizen | $898,806 00 | |
| Non-resident | 11,367 00 | |
| Alien | 6,015 00 | |
| Duplicate | 356 00 | |
| Total angling | | $916,544 00 |
| Hunting | | |
| Citizen | $20 00 | |
| Fish packer and shellfish dealer—citizen | 430 00 | |
| Deer tags | 6 00 | |
| Fish tags | 3,606 71 | |
| Game tags | 126 21 | |
| Market fishermen | 78,190 00 | |
| Fish importer | 65 00 | |
| Fish party boat permits | 529 00 | |
| Fish breeder | 400 00 | |
| Game breeder | 2,600 00 | |
| Kelp license | 40 00 | |
| Game management area licenses | 80 00 | |
| Total 1947 series | | $1,002,636 92 |
| 1946 series | | |
| Angling | | |
| Citizen | $773,065 00 | |
| Non-resident | 18,642 00 | |
| Alien | 6,520 00 | |
| Duplicate | 3,294 50 | |
| Total angling | | $801,521 50 |
| Hunting | | |
| Archery—citizen | $1,902 00 | |
| Citizen | 873,306 00 | |
| Junior | 41,317 00 | |
| Archery—non-resident | 145 00 | |
| Non-resident | 41,670 00 | |
| Declarant alien | 2,370 00 | |
| Alien | 3,225 00 | |
| Duplicate | 2,305 00 | |
| Total hunting | | $966,240 00 |
| Commercial hunting club | | $725 00 |
| Commercial hunting club operator | | $245 00 |
| Trapping | | |
| Citizen | $1,961 00 | |
| Alien | 28 00 | |
| | | $1,989 00 |
| Fish packer and shellfish dealer | | |
| Citizen | $1,790 00 | |
| Alien | 20 00 | |
| | | $1,810 00 |

## STATEMENT OF EXPENDITURES

### For the Period July 1, 1946, to June 30, 1947, as of July 31, 1947

### (Ninety-eighth Fiscal Year)

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Administration—101 | | | | |
| Education and public information | $6,262 96 | $12,072 86 | $1,481 58 | $19,817 40 |
| Executive | 10,650 00 | 7,703 98 | 1,159 03 | 19,513 01 |
| Exhibits | | 504 61 | | 504 61 |
| Library | 2,605 83 | 365 42 | 338 01 | 3,309 26 |
| Office | 25,539 89 | 115,509 95 | 296 83 | 141,346 67 |
| Unallocated | | 383 75 | | 383 75 |
| Undistributed | | —5 70 | | —5 70 |
| Total Administration | $45,058 68 | $136,534 87 | $3,275 45 | $184,869 00 |
| Patrol and Law Enforcement—104 | | | | |
| Airplane | | $1,487 03 | $3,201 87 | $4,688 90 |
| Cannery inspection | $8,647 26 | 25 15 | | 8,672 41 |
| Executive | 31,646 13 | 5,548 37 | 698 45 | 37,892 95 |
| Land patrol | 381,217 53 | 149,487 72 | 67,446 59 | 598,151 84 |
| Marine patrol | 108,950 37 | 54,129 51 | 21,220 96 | 184,300 84 |
| Office | 44,365 66 | 1,890 58 | 1,077 12 | 47,333 36 |
| Unallocated | | 10,168 55 | | 10,168 55 |
| Total Patrol and Law Enforcement | $574,826 95 | $222,736 91 | $93,644 99 | $891,208 85 |
| Marine Fisheries—105 | | | | |
| Central Valley Water Project and salmon study | $33,047 66 | $12,439 32 | $9,860 98 | $55,347 96 |
| Executive | 10,520 00 | 1,670 27 | 1,394 88 | 13,585 15 |
| Fish cannery auditing | | 6,451 01 | | 6,451 01 |
| Laboratory | 10,815 80 | 3,666 89 | 1,499 58 | 15,982 27 |
| Library | 2,041 86 | 67 15 | | 2,109 01 |
| Office | 12,241 60 | 2,085 08 | | 14,326 68 |
| Scientific investigation | 27,853 56 | 3,933 10 | 5 50 | 31,792 16 |
| Statistics | 35,796 45 | 10,356 36 | 54 44 | 46,207 25 |
| Unallocated | | 511 19 | | 511 19 |
| Total Marine Fisheries | $132,316 93 | $41,180 37 | $12,815 38 | $186,312 68 |
| Fish Conservation—106 | | | | |
| Biological survey | $38,122 48 | $11,047 28 | $3,694 44 | $52,864 20 |
| Executive survey | 16,740 00 | 2,127 49 | | 18,867 49 |
| Field supervision | 27,590 00 | 2,344 18 | 802 40 | 30,736 58 |
| Fish food unallocated | | 63,096 25 | | 63,096 25 |
| Fish planting | | 4,064 82 | 3,700 00 | 7,764 82 |
| Fish rescue | 8,652 91 | 2,585 44 | 3,009 92 | 14,248 27 |
| Fish screens | | 3,010 15 | 9 82 | 3,019 97 |
| Office | 10,659 76 | 293 33 | 339 18 | 11,292 27 |
| Operating expenses unallocated | | 1,358 27 | 298 07 | 1,656 34 |
| Pollution inspection | 3,320 00 | 105 14 | | 3,425 14 |
| Stream improvements | 6,045 02 | 124 66 | | 6,169 68 |
| Statistical | | 59 29 | | 59 29 |
| Structural maintenance | | 8 32 | | 8 32 |
| Unallocated | | 11,741 23 | 119 89 | 11,861 12 |
| Unallocated—auto, gas, oil | | 3,727 47 | | 3,727 47 |
| Alpine Hatchery | | 11 88 | | 11 88 |
| Basin Creek | 7,516 70 | 2,641 53 | 22 30 | 10,180 53 |
| Benbow Dam | 2,015 00 | 361 12 | | 2,376 12 |
| Black Rock Springs | | 336 99 | | 336 99 |
| Blue Lake Egg Collecting Station | | 98 10 | | 98 10 |
| Brookdale | 7,821 29 | 1,988 18 | 184 23 | 9,993 70 |
| Burney Creek Hatchery | 8,478 46 | 2,316 79 | 35 14 | 10,830 39 |
| Cedar Creek | | 538 66 | | 538 66 |
| Central Valley | 10,343 54 | 3,506 79 | 61 17 | 13,911 50 |
| Copco Egg Collecting Station | | 85 00 | 256 25 | 341 25 |
| Coy Flat | 113 41 | 75 68 | | 189 09 |
| Crystal Lake | | 10 69 | 78 39 | 89 08 |
| Fall Creek Hatchery | | 1,018 79 | 9 33 | 1,028 12 |
| Feather River Hatchery | | 2,278 52 | 80 43 | 2,358 95 |
| Fillmore Hatchery | | 16,482 85 | 8,096 56 | 24,579 41 |

## STATEMENT OF EXPENDITURES—Continued

### For the Period July 1, 1946, to June 30, 1947, as of July 31, 1947—Continued

### (Ninety-eighth Fiscal Year)

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Fish Conservation—Continued | | | | |
| Additional— | | | | |
| Fall Creek Hatchery | $6,605 01 | | | |
| Feather River Hatchery | 6,232 84 | | | |
| Fillmore Hatchery | 26,806 05 | | | $39,643 90 |
| Heenan Lake Egg Collecting Station | | $107 20 | | 107 20 |
| Hot Creek Hatchery | 20,627 78 | 39,764 59 | $2,161 51 | 62,553 88 |
| Huntington Lake | 325 00 | 6 15 | | 331 15 |
| June Lake Egg Collecting Station | 193 55 | | | 193 55 |
| Kaweah Hatchery | 7,146 31 | 1,660 30 | 12 55 | 8,819 16 |
| Kern Hatchery | 3,585 28 | 2,148 06 | 1,166 07 | 6,899 41 |
| Kings River Hatchery | 7,832 75 | 3,183 00 | 76 77 | 11,092 52 |
| Klamathon | | 434 43 | | 434 43 |
| Lake Almanor Hatchery | 9,967 39 | 2,890 55 | 103 93 | 12,961 87 |
| Little Walker Lake | | 113 45 | | 113 45 |
| Mad River Egg Collecting Station | 1,029 74 | | | 1,029 74 |
| Mojave River Hatchery | 1,240 00 | 317 36 | 7,727 39 | 9,284 75 |
| Moorehouse Springs Hatchery | | 244 50 | 32 98 | 277 48 |
| Mt. Shasta Hatchery | 58,556 97 | 14,252 06 | 565 62 | 73,374 65 |
| Mt. Tallac Hatchery | 5,026 46 | 2,845 50 | 2,796 10 | 10,668 06 |
| Mt. Whitney | 29,890 95 | 31,944 87 | 4,227 50 | 66,063 32 |
| Owens Park Experimental Ponds | | 184 76 | | 184 76 |
| Prairie Creek Hatchery | 7,828 53 | 2,217 63 | 202 59 | 10,248 75 |
| Rush Creek Hatchery | | 24 20 | | 24 20 |
| San Lorenzo Hatchery | | 72 86 | | 72 86 |
| Sequoia Hatchery | 5,794 51 | 1,425 98 | 18 99 | 7,239 48 |
| Shasta River Hatchery | 476 67 | 318 97 | | 795 64 |
| Snow Mountain Hatchery | 1,013 54 | 325 72 | | 1,339 26 |
| Tahoe Hatchery | 7,480 40 | 4,779 32 | 3,499 33 | 15,759 05 |
| Tuolumne | 837 74 | | | 837 74 |
| Whittier Hatchery | 10,607 10 | 2,809 15 | 99 43 | 13,515 68 |
| Yosemite Hatchery | 6,614 51 | 1,703 76 | | 8,318 27 |
| Yreka Warehouse | | | 6 66 | 6 66 |
| Yuba River Hatchery | 4,246 13 | 219 93 | | 4,466 06 |
| Total Fish Conservation | $377,383 78 | $251,439 19 | $43,494 94 | $672,317 91 |
| Game Conservation—108 | | | | |
| Brawley Game Farm | $940 00 | $526 60 | $1,092 78 | $2,559 38 |
| Castaic Farm | 2,640 00 | 755 52 | | 3,395 52 |
| Chino Farm | | 338 91 | 1,229 15 | 1,568 06 |
| Elk Refuge | 2,980 00 | 1,071 64 | | 4,051 64 |
| Executive | 15,474 61 | 3,142 89 | 941 24 | 19,558 74 |
| Fresno Game Farm | 9,101 50 | 4,283 87 | 70 54 | 13,455 91 |
| Game Bird District—Los Serranos | 400 00 | | | 400 00 |
| Game Management | 45,839 23 | 24,256 05 | 652 51 | 70,747 79 |
| Grey Lodge Refuge | 8,263 32 | 1,178 85 | | 9,442 17 |
| Honey Lake Refuge | 8,821 41 | 4,183 42 | 409 07 | 13,413 90 |
| Imperial Refuge | 4,910 00 | 1,618 66 | | 6,528 66 |
| Imperial Valley Public Shoot Grounds | | 2,204 08 | | 2,204 08 |
| Los Banos Refuge | 5,640 00 | 2,045 41 | 76 96 | 7,762 37 |
| Los Serranos Game Farm | 18,914 87 | 11,277 68 | 25 33 | 30,217 88 |
| Marysville Game Farm | | | 1,119 06 | 1,119 06 |
| Office | 9,217 40 | 628 65 | 306 21 | 10,152 26 |
| Porterville Game Farm | 1,619 35 | 737 86 | 1,122 16 | 3,479 37 |
| Predatory Animal Lion Hunting | 12,647 90 | 13,293 09 | 51 87 | 25,992 86 |
| Predatory Animal Trapping | 74,481 52 | 26,986 87 | 5,107 97 | 106,576 36 |
| Predatory Birds | | 372 00 | | 372 00 |
| Redding Game Farm | 5,128 57 | 1,965 47 | 1,052 04 | 8,146 08 |
| Research | 15,379 03 | 5,418 08 | 1,640 23 | 22,437 34 |
| Sacramento Game Farm | 5,050 98 | 1,665 08 | | 6,716 06 |
| Statistics | | 1,527 37 | | 1,527 37 |
| Suisun Refuge | 4,525 07 | 1,032 07 | 24 81 | 5,581 95 |
| Tehama Winter Deer Range | | | 7 69 | 7 69 |
| Unallocated—auto, gas, oil | | 4,114 13 | | 4,114 13 |
| Ukiah | | 277 63 | | 277 63 |
| Valley Center | 1,910 00 | 809 62 | | 2,719 62 |
| Valley Center Farm | | 88 44 | | 88 44 |
| Visalia | 310 00 | | | 310 00 |
| Willows Game Farm | 3,181 28 | 1,517 60 | | 4,698 88 |
| Winter feeding and salting of game | | 4 55 | | 4 55 |
| Yountville Boarding House | 2,079 02 | 5,093 54 | | 7,172 56 |
| Yountville Game Farm | 34,381 40 | 18,344 79 | 267 48 | 52,996 67 |
| Total Game Conservation | $293,839 46 | $140,760 42 | $15,197 10 | $449,796 98 |

## STATEMENT OF EXPENDITURES—Continued

### For the Period July 1, 1946, to June 30, 1947, as of July 31, 1947—Continued

### (Ninety-eighth Fiscal Year)

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Licenses—111 | | | | |
| Executive | $9,180 00 | $1,629 93 | | $10,809 93 |
| License distribution | 23,770 95 | 194,138 17 | $1,046 90 | 218,956 02 |
| Office | 2,537 90 | 1,722 35 | 6 02 | 4,266 27 |
| Unallocated—auto, gas, oil | | 169 98 | | 169 98 |
| Total Licenses | $35,488 85 | $197,660 43 | $1,052 92 | $234,202 20 |
| Construction of Fish Screens and Stream Improvements | | | | |
| Reg—First quarter | | $808 24 | | |
| BL—op—First quarter | | 279 33 | | |
| Reg—Second quarter | | 688 30 | | |
| BL—op—Second quarter | | 131 01 | | |
| Reg—Third quarter | | 1,034 96 | | |
| Reg—Fourth quarter | | 313 01 | | |
| Total Fish Screens | | $3,254 85 | | $3,254 85 |
| Total Fish and Game Supplement Ninety-eighth Fiscal Year | | | | $2,621,962 47 |
| Less Estimated Maintenance, Deductions | | | | 13,312 92 |
| Net Total Fish and Game Supplement Ninety-eighth Fiscal Year | | | | $2,608,649 55 |
| Total Operating Expenditures Ninety-eighth Fiscal Year | | | | $2,608,649 55 |
| Additions and Betterments | | | | |
| Land | | | | |
| Appraisal of Welch Tract in Colusa County | | | $323 69 | |
| Acquisition, establishment, maintenance of fish hatchery, Ch. 1439-45 Los Angeles County | | | 7,214 95 | |
| San Bernardino County | | | 19,271 97 | |
| Improvements—Ch. 644-45 | | | | |
| Alteration and modernization of hatchery buildings | | | 7,902 98 | |
| Alteration to Botanical Gardens Building—Game Conservation Research Laboratory | | | 3,050 29 | |
| Brooder houses and pens—Ch. 106-46 | | | | |
| Sacramento Game Farm | | | 132 41 | |
| Brooder houses and pens—Ch. 644-45 | | | | |
| Yountville Game Farm | | | 4,166 82 | |
| Brookdale Hatchery propane installation | | | 1,128 00 | |
| Central Valley Hatchery | | | 682 78 | |
| Coast counties quail project warehouse | | | 1,363 17 | |
| Construction of rearing ponds—all hatcheries | | | 122 84 | |
| Construction of salmon traps in Central Valleys and Trinity River watersheds | | | 60 00 | |
| Construction and equipment of workman shop and warehouse at Yreka | | | 2,143 05 | |
| Cattle guard fence Crystal Lake Hatchery | | | 11,000 00 | |
| Crystal Lake Hatchery | | | 116,428 59 | |
| Drilling of well—Kern Hatchery | | | 461 79 | |
| Engineering project | | | 10,000 00 | |
| Experimental electrical and mechanical fish screens | | | 8,455 03 | |
| Fish ladders and dams | | | | |
| Clough Dam on Mill Creek | | | 8,000 00 | |
| Woodbridge Dam | | | 65,400 00 | |
| Game conservation | | | | |
| Game farms—miscellaneous improvement | | | 4,009 74 | |
| Honey Lake Refuge | | | 522 61 | |
| Imperial County public shooting grounds | | | 1,633 83 | |

## STATEMENT OF EXPENDITURES—Continued

### For the Period July 1, 1946, to June 30, 1947, as of July 31, 1947—Continued

### (Ninety-eighth Fiscal Year)

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Additions and Betterments—Continued | | | | |
| Improvement of game farms | | | | |
| Brawley | | | $6,183 30 | |
| Chico | | | 448 11 | |
| Marysville | | | 4,306 72 | |
| Porterville | | | 5,737 28 | |
| Improvement to Tule Lake and Madeline Reservoirs | | | 4,114 72 | |
| Kern Hatchery | | | 172 56 | |
| Mt. Tallac Hatchery | | | 63 88 | |
| Mt. Whitney Hatchery wire installations | | | 850 00 | |
| New construction—Tahoe Hatchery | | | 3,705 50 | |
| Redding Game Farm—cottage and garage | | | 5,175 00 | |
| Redding warehouse | | | 358 05 | |
| Remodel living quarters | | | | |
| Fresno Game Farm | | | 501 23 | |
| Sacramento Game Farm | | | 52 10 | |
| Replace pipe lines—all hatcheries | | | 794 17 | |
| Tahoe Hatchery improvement | | | 194 24 | |
| Tehama winter range | | | 5,385 00 | |
| Terminal Island Laboratory | | | 4,500 00 | |
| Terminal Island parking area paving | | | 760 00 | |
| Tuna Fisheries Research Facilities | | | 640 63 | |
| Total Additions and Betterments | | | | $317,417 03 |
| Special Item—cooperation with Federal Government—Pittman-Robertson Act | | | OE-Equip. | |
| All projects | $36,688 68 | | $107,632 85 | $144,321 53 |
| Less indirect abatement from Federal Government—Pro rata share Pittman-Robertson Act | | | | 30,937 46 |
| Net Total Pittman-Robertson Act | | | | $113,384 07 |
| Contributions to State Employees Retirement Fund | | | | 108,358 97 |
| Grand Total Fish and Game Preservation Fund Ninety-eighth Fiscal Year | | | | $3,147,809 62 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Divisional Administration—1A | | | | |
| Executive | $11,387 35 | | | $11,387 35 |
| Library | 6,635 27 | | | 6,635 27 |
| Office | 39,490 87 | $7,643 00 | $1,932 00 | 49,065 87 |
| Accident and death claims | | 16,356 00 | | 16,356 00 |
| Automobile mileage | | 667 00 | | 667 00 |
| Automobile operation | | 1,440 00 | 50 00 | 1,490 00 |
| Freight, cartage and express | | 1,682 00 | | 1,682 00 |
| Legal advertising | | 1,889 00 | | 1,889 00 |
| Light, heat and power | | 2,187 00 | | 2,187 00 |
| Postage | | 13,973 00 | | 13,973 00 |
| Printing | | 5,601 00 | | 5,601 00 |
| Pro rata Attorney General's services | | 6,000 00 | | 6,000 00 |
| Pro rata departmental administration | | 58,623 00 | | 58,623 00 |
| Pro rata Personnel Board's service | | 21,780 00 | | 21,780 00 |
| Pro rata general fiscal administration | | 21,275 00 | | 21,275 00 |
| Rent of premises | | 14,449 00 | | 14,449 00 |
| Repair of equipment | | 63 00 | | 63 00 |
| Telephone and telegraph | | 13,832 00 | | 13,832 00 |
| Travel | | 9,408 00 | | 9,408 00 |
| Repair of premises | | 601 00 | | 601 00 |
| Operating equipment | | | 3 00 | 3 00 |
| Photography | | | 5 00 | 5 00 |
| Total Administration | $57,513 49 | $197,469 00 | $1,990 00 | $256,972 49 |
| Conservation Education and Public Information | | | | |
| Regular help | $9,775 00 | | | $9,775 00 |
| Exhibits | | $1,489 00 | | 1,489 00 |
| Operating supplies and expenses | | 2,079 00 | | 2,079 00 |
| Photography | | 25,263 00 | $1,395 00 | 26,658 00 |
| Printing | | 25,297 00 | | 25,297 00 |
| Rent of equipment | | 25 00 | | 25 00 |
| Repair of equipment | | 31 00 | | 31 00 |
| Telephone and telegraph | | 98 00 | | 98 00 |
| Travel | | 2,051 00 | | 2,051 00 |
| Office | | | 150 00 | 150 00 |
| Operating equipment | | | 372 00 | 372 00 |
| Automobile operation | | 1,440 00 | | 1,440 00 |
| Books and publications | | | 710 00 | 710 00 |
| Freight, cartage and express | | 3 00 | | 3 00 |
| Total Conservation Education and Public Information | $9,775 00 | $57,776 00 | $2,627 00 | $70,178 00 |
| Patrol and Law Enforcement—1B | | | | |
| Air patrol | $2,873 40 | | | $2,873 40 |
| Headquarters | 21,008 88 | | | 21,008 88 |
| Cannery inspector | 13,128 92 | | | 13,128 92 |
| Land patrol | 478,775 36 | | | 478,775 36 |
| Marine patrol, headquarters | 99,753 58 | | | 99,753 58 |
| Marine patrol | 39,150 30 | | | 39,150 30 |
| Airplane | | $205 00 | $146 00 | 351 00 |
| Auto | | 118,732 00 | 84,875 00 | 203,607 00 |
| Auto mileage | | 24 00 | | 24 00 |
| Boats operation | | 22,049 00 | 25,480 00 | 47,529 00 |
| Freight, cartage and express | | 167 00 | | 167 00 |
| Light, heat and power | | 329 00 | | 329 00 |
| Office | | 53 00 | 617 00 | 670 00 |
| Operating | | 18,283 00 | 5,717 00 | 24,000 00 |
| Photography | | 60 00 | 200 00 | 260 00 |
| Postage | | 160 00 | | 160 00 |
| Printing | | 2,321 00 | | 2,321 00 |
| Rent of equipment | | 2,103 00 | | 2,103 00 |
| Rent of premises | | 6,544 00 | | 6,544 00 |
| Telephone and telegraph | | 16,294 00 | | 16,294 00 |
| Travel | | 126,525 00 | | 126,525 00 |
| Undercover service | | 9,000 00 | | 9,000 00 |
| Radio | | | 12,679 00 | 12,679 00 |
| Total Patrol and Law Enforcement | $654,690 44 | $322,819 00 | $129,714 00 | $1,107,253 44 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

For the Period July 1, 1947, to June 30, 1948

(Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Marine Fisheries—1C | | | | |
| Headquarters | $33,591 87 | | | $33,591 87 |
| Central Valley's investigation | 34,570 22 | | | 34,570 22 |
| Library | 3,060 00 | $194 00 | | 3,254 00 |
| Marine fisheries investigation | 59,999 33 | | | 59,999 33 |
| Statistics | 52,039 82 | | | 52,039 82 |
| Vessel—N. B. Schofield | 22,347 49 | | | 22,347 49 |
| Auditing (professional services) | | 5,922 00 | | 5,922 00 |
| Auto operations | | 8,542 00 | $6,770 00 | 15,312 00 |
| Auto mileage | | 117 00 | | 117 00 |
| Cooperative research | | 612 00 | | 612 00 |
| Fish tagging | | 4,762 00 | | 4,762 00 |
| Freight, cartage and express | | 232 00 | | 232 00 |
| Laboratory supplies | | 1,266 00 | | 1,266 00 |
| Light, heat and power | | 1,847 00 | | 1,847 00 |
| Operating | | 14,424 00 | 17,106 00 | 31,530 00 |
| Photography | | 549 00 | 236 00 | 785 00 |
| Postage | | 64 00 | | 64 00 |
| Printing | | 13,251 00 | | 13,251 00 |
| Rent of equipment | | 8,487 00 | | 8,487 00 |
| Rent of premises | | 1,629 00 | | 1,629 00 |
| Repair of premises | | 2,282 00 | | 2,282 00 |
| Telephone and telegraph | | 671 00 | | 671 00 |
| Travel | | 14,750 00 | | 14,750 00 |
| Boat operations | | 16,016 00 | | 16,016 00 |
| Books and publications | | | 126 00 | 126 00 |
| Office | | | 295 00 | 295 00 |
| Household | | | 63 00 | 63 00 |
| Total Marine Fisheries | $205,608 73 | $95,617 00 | $24,596 00 | $325,821 73 |
| Fish Conservation—1D | | | | |
| Biological survey | $64,116 12 | | | $64,116 12 |
| Headquarters | 27,772 10 | | | 27,772 10 |
| Fish screen and stream improvements | 13,235 55 | | | 13,235 55 |
| Hatcheries | 315,025 64 | | | 315,025 64 |
| Hatchery supervisor | 29,524 18 | | | 29,524 18 |
| Auto | | $44,360 00 | $18,932 00 | 63,292 00 |
| Eyed eggs | | 7,825 00 | | 7,825 00 |
| Fish food | | 196,266 00 | | 196,266 00 |
| Freight, cartage, express | | 9,708 00 | | 9,708 00 |
| Laboratory supplies | | 16,001 00 | | 16,001 00 |
| Light, heat and power | | 26,446 00 | | 26,446 00 |
| Operating | | 15,102 00 | 17,789 00 | 32,891 00 |
| Photography | | 265 00 | 221 00 | 486 00 |
| Postage | | 1,222 00 | | 1,222 00 |
| Printing | | 1,040 00 | | 1,040 00 |
| Rent of equipment | | 6,455 00 | | 6,455 00 |
| Rent of premises | | 7,619 00 | | 7,619 00 |
| Repair of equipment | | 6,990 00 | | 6,990 00 |
| Repair of premises | | 10,008 00 | | 10,008 00 |
| Telephone and telegraph | | 3,733 00 | | 3,733 00 |
| Travel | | 23,361 00 | | 23,361 00 |
| Refrigeration | | 3,500 00 | | 3,500 00 |
| Boats | | | 170 00 | 170 00 |
| Household | | | 2,944 00 | 2,944 00 |
| Office | | | 1,457 00 | 1,457 00 |
| Total Fish Conservation | $449,673 59 | $379,901 00 | $41,513 00 | $871,087 59 |
| Game Conservation—1F | | | | |
| Field supervision | $72,669 03 | | | $72,669 03 |
| Game farms | 116,991 30 | | | 116,991 30 |
| Game management | 85,110 59 | | | 85,110 59 |
| Headquarters | 21,069 14 | | | 21,069 14 |
| Predatory animal control | 103,575 09 | | | 103,575 09 |
| Auto mileage | | $28 00 | | 28 00 |
| Auto | | 58,993 00 | $76,984 00 | 135,977 00 |
| Bounties | | 11,429 00 | | 11,429 00 |
| Freight, cartage, express | | 199 00 | | 199 00 |
| Game foods | | 30,005 00 | | 30,005 00 |
| Laboratory supplies | | 1,324 00 | | 1,324 00 |
| Light, heat and power | | 14,473 00 | | 14,473 00 |
| Office | | | 1,458 00 | 1,458 00 |
| Operating | | 18,166 00 | 48,041 00 | 66,207 00 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Game Conservation—1F—Continued | | | | |
| Photography | | $440 00 | $270 00 | $710 00 |
| Postage | | 207 00 | | 207 00 |
| Printing | | 1,884 00 | | 1,884 00 |
| Rent of building space | | 5,173 00 | | 5,173 00 |
| Rent of equipment | | 4,261 00 | | 4,261 00 |
| Repair and maintenance of structures | | 4,341 00 | | 4,341 00 |
| Repair of equipment | | 2,525 00 | | 2,525 00 |
| Boarding house (subsistence) | | 4,065 00 | | 4,065 00 |
| Telephone and telegraph | | 2,698 00 | | 2,698 00 |
| Travel | | 32,860 00 | | 32,860 00 |
| Less: Reimbursement for auto operation | | | | |
| Pittman-Robertson | | —10,699 00 | | —10,699 00 |
| Household | | | 877 00 | 877 00 |
| Housing and subsistence | | | 5,638 00 | 5,638 00 |
| Total Game Conservation | $399,415 15 | $182,372 00 | $133,268 00 | $715,055 15 |
| Licenses—1G | | | | |
| Regular help | $39,749 08 | | | $39,749 08 |
| Automobile | | $1,056 43 | $721 50 | $1,777 93 |
| Freight, cartage, express | | 2,910 59 | | 2,910 59 |
| License commissions—paid to agent | | 44,901 27 | | 44,901 27 |
| Office | | 590 25 | 988 26 | 1,578 51 |
| Postage | | 3,438 40 | | 3,438 40 |
| Premium on bonds | | 7,878 56 | | 7,878 56 |
| Printing | | 22,079 11 | | 22,079 11 |
| Rent | | 1,222 25 | | 1,222 25 |
| Telephone and telegraph | | 160 18 | | 160 18 |
| Travel | | 1,701 24 | | 1,701 24 |
| Operating equipment | | | 9 48 | 9 48 |
| Total Licenses | $39,749 08 | $85,938 28 | $1,719 24 | $127,406 60 |
| Total allotment for support—Ninety-ninth Fiscal Year | | | | $3,473,775 00 |
| Less estimated maintenance deductions | | | | 15,806 30 |
| Net total allotment for support—Ninety-ninth Fiscal Year | | | | $3,457,968 70 |
| Special Claim for Secretary of State Board of Control | | $905 36 | | $905 36 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

For the Period July 1, 1947, to June 30, 1948

(Ninety-ninth Fiscal Year)—Continued

| Function | Detail | Total |
|---|---|---|
| Construction, Improvements, Repairs, and Equipment | | |
| District offices: | | |
| Redding and Alturas | $10,443 00 | |
| Improvements to land and buildings | 4,000 00 | |
| Purchase of boat | 118,309 00 | |
| Purchase of airplane | 30,000 00 | |
| Terminal Island laboratory: | | |
| Improvements to heating system | 4,500 00 | |
| Alterations and improvements—miscellaneous | 1,455 00 | |
| Research vessel | 77,612 00 | |
| Central Valley hatchery: | | |
| Refrigeration facilities | 1,714 00 | |
| Sewer | 576 00 | |
| Fall Creek hatchery: | | |
| Repairs to building | 981 00 | |
| Fillmore hatchery: | | |
| Water facilities | 4,570 00 | |
| Refrigeration facilities | 528 00 | |
| Fresno: | | |
| Experimental fish rearing tanks | 987 00 | |
| Hot Creek hatchery: | | |
| Improvements to bachelor quarters | 973 00 | |
| Kaweah hatchery: | | |
| Cabin | 1,805 00 | |
| Lake Almanor hatchery: | | |
| Miscellaneous improvements | 725 00 | |
| Mt. Shasta hatchery: | | |
| Repairs to residence | 2,703 00 | |
| Mt. Whitney hatchery: | | |
| Repairs to bachelor quarters | 1,523 00 | |
| Pond improvements | 3,070 00 | |
| Bottled gas facilities | 4,605 00 | |
| Spawning and planting tanks | 855 00 | |
| Refrigeration facilities | 2,692 00 | |
| Kern River hatchery: | | |
| Refrigeration facilities | 3,449 00 | |
| Madera hatchery: | | |
| Electrification | 408 00 | |
| Repairs to building | 381 00 | |
| Repairs to living quarters | 627 00 | |
| Mojave River hatchery: | | |
| Water pump | 1,779 00 | |
| Food preparation facilities | 637 00 | |
| Electrical standby unit | 4,464 00 | |
| Prairie Creek hatchery: | | |
| Improvements to water system | 1,482 00 | |
| Mt. Tallac hatchery: | | |
| Miscellaneous improvements | 40 00 | |
| Sequoia hatchery: | | |
| Miscellaneous improvements | 1,283 00 | |
| Whittier hatchery: | | |
| Food preparation facilities | 1,087 00 | |
| Improvements to utility building | 300 00 | |
| Tahoe hatchery: | | |
| Miscellaneous improvements | 631 00 | |
| Yuba River hatchery: | | |
| Electrification | 241 00 | |
| Tehama winter range: | | |
| Fencing | 817 00 | |
| Imperial Valley waterfowl management area: | | |
| Improvements to ponds | 3,337 00 | |
| Suisun refuge: | | |
| Water supply | 337 00 | |
| Los Banos refuge: | | |
| Water facilities | 2,884 00 | |
| Alterations to cottage | 487 00 | |
| Food habits and disease laboratory: | | |
| Improvements | 5,073 00 | |
| Valley Center Game farm: | | |
| Pump and well | 4,500 00 | |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Detail | Total |
|---|---|---|
| Construction, Improvements, Repairs, and Equipment—Continued | | |
| Los Banos game farm: | | |
| Pump, well, tank, and pipe | 1,158 00 | |
| Brooders, tool room, and equipment | 2,574 00 | |
| Garage and cabin | 4,026 00 | |
| Machinery | 1,933 00 | |
| Construction of rearing pens for pheasants: | | |
| Rearing and holding pens | 4,596 00 | |
| Total Construction, Improvements, Repairs, and Equipment | | $323,160 00 |
| Special Item—Cooperation with Federal Government pro rata share Pittman-Robertson Act | | |
| Restoration of valley quail in Sierra foothills | $13,298 25 | |
| Evaluation of quail development and management practice in California | 360 87 | |
| Study of production, migration, and wintering areas of waterfowl in California | 3,190 48 | |
| Effects of brush removal on game ranges in California | 2,768 16 | |
| Study of deer population and management problems in California | 10,145 50 | |
| Food habits of mountain quail, ringnecked pheasant and coyote of California | 7,887 43 | |
| Life history and management of ringnecked pheasant in California | 13,882 02 | |
| Survey of waterfowl food plants of California | 1,099 21 | |
| Life history and management of mountain quail in California | 6,617 29 | |
| Doyle winter range | 29,266 88 | |
| Tehama winter deer range (Section No. 7) | 1,262 65 | |
| Tehama winter deer range (Section No. 6) | 16,742 70 | |
| Restoration of valley quail in all south coast ranges | 21,200 87 | |
| Beaver transplanting | 5,985 30 | |
| Total Pittman-Robertson Act | | $133,707 61 |
| Less reimbursement from Federal Government, Pittman-Robertson Act | | —100,278 00 |
| Net total Pittman-Robertson, Ninety-ninth Fiscal Year | | $33,429 61 |
| Contributions to Employees' Retirement Fund | | 260,000 00 |
| Repair, restoration and maintenance of Jenner Jetty | | 37,500 00 |
| Grand Total Fish and Game Preservation Fund—Ninety-ninth Fiscal Year | | $4,112,058 31 |
| General Fund | | |
| Pacific Marine Fisheries Compact Expenses, Chapter 1447-47 | | $11,000 00 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Wildlife Restoration Fund | | | | |
| Support—Administration | | | | |
| Senior Stenographer-Clerk | $1,242 00 | | | $1,242 00 |
| Office | | $3 00 | $581 00 | 584 00 |
| Printing | | 155 00 | | 155 00 |
| Telephone and telegraph | | 6 00 | | 6 00 |
| Traveling | | 984 00 | | 984 00 |
| Automobile | | 34 00 | 1,671 00 | 1,705 00 |
| Rent | | 10 00 | | 10 00 |
| Pro rata departmental administration | | 125 00 | | 125 00 |
| Pro rata Personnel Board's services | | 75 00 | | 75 00 |
| Total support Wildlife Restoration Fund | $1,242 00 | $1,392 00 | $2,252 00 | $4,886 00 |

| Function | Detail | Total |
|---|---|---|
| Wildlife Restoration Fund | | |
| Capital Outlay—Construction, Improvements, Repairs, and Equipment | | |
| Marine Fisheries | | |
| Deer Creek fish screens | $3,575 00 | |
| Preliminary work—architectural services | 5,000 00 | |
| Total Marine Fisheries | | $8,575 00 |
| Fish Conservation | | |
| Crystal Lake hatchery: | | |
| Improvements to ponds | $5,271 00 | |
| Miscellaneous improvements | 1,838 00 | |
| Repairs to ranch house | 682 00 | |
| Refrigeration facilities | 1,017 00 | |
| Buildings and miscellaneous developments | 115,000 00 | |
| Total Fish Conservation | | 123,808 00 |
| Game Conservation | | |
| Brawley game farm: | | |
| Rearing and holding pens | $5,146 00 | |
| Pump, well, tank, and pipes | 954 00 | |
| Brooders, tool room and equipment | 2,753 00 | |
| Cabin and garage | 2,384 00 | |
| Incubator | 2,562 00 | |
| Chico game farm: | | |
| Rearing and holding pens | 4,931 00 | |
| Brooders, tool room and equipment | 3,767 00 | |
| Cabin and garage | 3,459 00 | |
| Machinery | 3,110 00 | |
| Marysville game farm: | | |
| Rearing and holding pens | 4,711 00 | |
| Pump, well, tanks, pipes, and hardware | 3,726 00 | |
| Brooder houses, feed room, tool room, and miscellaneous equipment | 2,540 00 | |
| Cabin and garage | 1,787 00 | |
| Porterville game farm: | | |
| Rearing and holding pens | 2,727 00 | |
| Pump, well, tanks, pipes, and hardware | 2,283 00 | |
| Brooders, tool room, and equipment | 1,992 00 | |
| Coast counties quail habitat: | | |
| Quonset type hut | 2,242 00 | |
| Water and feed facilities | 613 00 | |
| Southern California quail development: | | |
| Salaries and wages | 1,023 00 | |
| Operating expenses | 1,126 00 | |
| Equipment | 18,147 00 | |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Detail | Total |
|---|---|---|
| Wildlife Restoration Fund—Continued | | |
| Capital Outlay—Construction, Improvements, Repairs and Equipment—Continued | | |
| Game Conservation—Continued | | |
| Honey Lake waterfowl management area: | | |
| Improvements to water control facilities and pond developments: | | |
| Reservoir field | $3,078 00 | |
| New road field | 3,332 00 | |
| Upper Lake fields | 727 00 | |
| Lower Lake fields | 2,290 00 | |
| Dakin ranch—Hartson reservoir and flood channel | 2,060 00 | |
| Dakin ranch—miscellaneous project | 1,838 00 | |
| Fleming ranch—improvements to reservoir dam and bed | 1,080 00 | |
| Imperial Valley public shooting grounds: | | |
| Land leveling and lease | 11,998 00 | |
| Development of south pumice unit | 1,250 00 | |
| Development of north pumice unit | 4,500 00 | |
| Madeline plains waterfowl development: | | |
| Garage and workshop | 2,974 00 | |
| Water control facilities | 1,614 00 | |
| Miscellaneous improvements to buildings and grounds | 510 00 | |
| Fencing | 2,533 00 | |
| Delivery ditch improvement | 4,560 00 | |
| Pump and well | 1,000 00 | |
| Total, Game Conservation | | $117,327 00 |
| Totals, Construction, Improvements, Repairs, and Equipment | | 249,710 00 |
| Contribution to State Employees' Retirement System | | 117 00 |
| Total, Wildlife Restoration Fund | | $254,713 00 |

## STATEMENT OF REVENUE

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)

| | Detail | Total |
|---|---|---|
| Revenue for Fish and Game Preservation Fund: | | |
| 1948 Series: | | |
| Angling citizen | $1,458,997 00 | |
| Angling excess fee | 210 10 | |
| Nonresident one year | 9,265 00 | |
| Nonresident ten day | 1,163 50 | |
| Alien | 17,550 00 | |
| Duplicate | 493 50 | |
| Fish tags | 6,348 80 | |
| Game tags | 165 36 | |
| Fish importer | 70 00 | |
| Fish party boat permits | 617 00 | |
| Market fishermen | 73,440 00 | |
| Fish breeder | 505 00 | |
| Game breeder | 2,565 00 | |
| Kelp license | 10 00 | |
| Game management area licenses | 350 00 | |
| Game management area tags | 3 60 | |
| Hunting license | 48 00 | |
| Deer tags | 12 00 | |
| Deer meat agents locker permits | 7,264 00 | |
| Deer meat agents—wardens | 304 00 | |
| Total 1948 series | | $1,579,381 86 |
| 1947 series: | | |
| Angling citizen | $843,276 00 | |
| Alien | 6,650 00 | |
| Nonresident | 22,299 00 | |
| Duplicate | 4,613 50 | |
| Hunting archery citizen | 2,332 00 | |
| Archery nonresident | 75 00 | |
| Hunting citizen | 915,509 00 | |
| Hunting junior | 43,983 00 | |
| Hunting nonresident | 48,080 00 | |
| Hunting declared alien | 2,450 00 | |
| Hunting alien | 2,950 00 | |
| Hunting duplicate | 3,276 50 | |
| Hunting commercial club citizen | 675 00 | |
| Hunting commercial club opr. citizen | 225 00 | |
| Trapping citizen | 1,570 00 | |
| Trapping alien | 24 00 | |
| Fish packer and shellfish dealer citizen | 14,795 00 | |
| Fish packer and shellfish dealer alien | 580 00 | |
| Archery deer tags | 590 00 | |
| Deer tags | 299,604 00 | |
| Fish tags | 3,891 76 | |
| Game tags | 344 70 | |
| Market fishermen | 50,810 00 | |
| Fish importer | 40 00 | |
| Fish party boat permits | 155 00 | |
| Fish breeder | 70 00 | |
| Game breeder | 250 00 | |
| Kelp license | 50 00 | |
| Game management area licenses | 120 00 | |
| Game management area tags | 178 68 | |
| Deer meat agents locker permits | 4,000 00 | |
| Deer meat agents wardens | 397 00 | |
| Total 1947 series | | $2,273,864 14 |

## STATEMENT OF REVENUE—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| | Detail | Total |
|---|---|---|
| Revenue for Fish and Game Preservation Fund: | | |
| 1946 series: | | |
| Angling citizen | $4 00 | |
| Angling alien | 5 00 | |
| Hunting citizen | 254 00 | |
| Hunting junior | 22 00 | |
| Hunting duplicate | 11 00 | |
| Trapping citizen | 3 00 | |
| Total 1946 series | | $299 00 |
| Other revenue: | | |
| Lease of kelp beds | $1,565 00 | |
| Fish packers tax | 192,061 36 | |
| Kelp tax | 2,098 05 | |
| Salmon packers tax | 77,895 66 | |
| Sardine tax | 40,294 43 | |
| Public shooting grounds | 1,830 00 | |
| Miscellaneous | 27,534 99 | |
| Court fines | 123,739 25 | |
| Interest on surplus money investment fund | 15,430 41 | |
| Total other revenue | | $482,449 15 |
| Grand total Fish and Game Preservation Fund | | $4,335,994 15 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Administration: | | | | |
| Conservation education and public information | $9,774 67 | | | |
| Executive | 11,387 35 | | | |
| Library | 6,635 27 | | | $27,797 29 |
| Office | 39,490 87 | $7,643 00 | $1,931 52 | 49,065 39 |
| Accident and death claims | | 16,356 00 | | |
| Auto mileage | | 667 00 | | 17,023 00 |
| Auto operation | | 1,440 00 | 48 58 | 1,488 58 |
| Freight, cartage, express | | 1,682 00 | | |
| Legal advertising | | 1,889 00 | | |
| Light, heat, power | | 2,187 00 | | |
| Postage | | 13,973 00 | | |
| Printing | | 5,601 00 | | |
| Pro rata Attorney General's service | | 6,000 00 | | |
| Pro rata departmental administration | | 58,623 00 | | |
| Pro rata Personnel Board service | | 21,780 00 | | |
| Pro rata general fiscal administration | | 21,275 00 | | |
| Rent of premises | | 14,449 00 | | |
| Repair of equipment | | 63 00 | | |
| Telephone and telegraph | | 13,832 00 | | |
| Travel | | 9,408 00 | | |
| Repair of premises | | 601 00 | | 171,363 00 |
| Books and publications | | | 709 90 | |
| Operating equipment | | | 371 48 | |
| Photography | | | 4 54 | 1,085 92 |
| Total Administration | $67,288 16 | $197,469 00 | $3,066 02 | $267,823 18 |
| Patrol and Law Enforcement: | | | | |
| Air patrol | $2,873 40 | | | |
| Headquarters | 21,008 88 | | | |
| Cannery inspector | 13,128 92 | | | |
| Land patrol | 476,775 36 | | | |
| Marine patrol, headquarters | 99,753 58 | | | |
| Marine patrol | 39,150 30 | | | $654,690 44 |
| Airplane | | $205 00 | $146 00 | 351 00 |
| Auto | | 118,732 00 | 84,875 00 | 203,607 00 |
| Auto mileage | | 24 00 | | 24 00 |
| Boats operation | | 22,049 00 | 25,480 00 | 47,529 00 |
| Freight, cartage, express | | 167 00 | | |
| Light, heat, power | | 329 00 | | 496 00 |
| Office | | 53 00 | 617 00 | 670 00 |
| Operating | | 18,283 00 | 5,717 00 | 24,000 00 |
| Photography | | 60 00 | 200 00 | 260 00 |
| Postage | | 160 00 | | |
| Printing | | 2,321 00 | | |
| Rent of equipment | | 2,103 00 | | |
| Rent of premises | | 6,544 00 | | |
| Telephone and telegraph | | 16,294 00 | | |
| Travel | | 126,525 00 | | |
| Undercover service | | 9,000 00 | | 162,947 00 |
| Radio | | | 12,679 00 | 12,679 00 |
| Total Patrol and Law Enforcement | $654,690 44 | $322,849 00 | $129,714 00 | $1,107,253 44 |
| Fish Conservation: | | | | |
| Biological survey | $64,116 12 | | | |
| Headquarters | 27,772 10 | | | |
| Fish screen and stream improvement | 13,235 55 | | | |
| Hatcheries | 315,025 64 | | | |
| Hatchery supervisor | 29,524 18 | | | $149,673 59 |
| Auto | | $44,360 00 | $18,932 00 | 63,292 00 |
| Eyed eggs | | 7,825 00 | | |
| Fish food | | 196,266 00 | | |
| Freight, cartage, express | | 9,708 00 | | |
| Laboratory supplies | | 16,001 00 | | |
| Light, heat, power | | 26,446 00 | | 256,246 00 |
| Operating | | 15,102 00 | 17,789 00 | 32,891 00 |
| Photography | | 265 00 | 221 00 | 486 00 |
| Postage | | 1,222 00 | | |
| Printing | | 1,040 00 | | |
| Rent of equipment | | 6,455 00 | | |
| Rent of premises | | 7,619 00 | | |
| Repair of equipment | | 6,990 00 | | |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Fish Conservation—Continued | | | | |
| Repair of premises | | $10,008 00 | | |
| Telephone and telegraph | | 3,733 00 | | |
| Travel | | 23,361 00 | | |
| Refrigeration | | 3,500 00 | | $63,928 00 |
| Boats | | | $170 00 | |
| Household | | | 2,944 00 | |
| Office | | | 1,457 00 | 4,571 00 |
| Total Fish Conservation | $449,673 59 | $379,901 00 | $41,513 00 | $871,087 59 |
| Marine Fisheries: | | | | |
| Headquarters | $33,591 87 | | | |
| Central Valleys investigation | 34,570 22 | | | $68,162 09 |
| Library | 3,060 00 | $194 00 | | 3,254 00 |
| Marine fisheries investigation | 59,999 33 | | | |
| Statistics | 52,039 82 | | | |
| Vessel—N. B. Scofield | 22,347 49 | | | 134,386 61 |
| Auditing—professional services | | 5,922 00 | | 5,922 00 |
| Auto operations | | 8,542 00 | $6,770 00 | 15,312 00 |
| Auto mileage | | 117 00 | | |
| Cooperative research | | 612 00 | | |
| Fish tagging | | 4,762 00 | | |
| Freight, cartage, express | | 232 00 | | |
| Laboratory supplies | | 1,266 00 | | |
| Light, heat, power | | 1,847 00 | | 8,836 00 |
| Operating | | 14,424 00 | 17,106 00 | 31,530 00 |
| Photography | | 549 00 | 236 00 | 785 00 |
| Postage | | 64 00 | | |
| Printing | | 13,251 00 | | |
| Rent of equipment | | 8,487 00 | | |
| Rent of premises | | 1,629 00 | | |
| Repair of premises | | 2,282 00 | | |
| Telephone and telegraph | | 671 00 | | |
| Travel | | 14,750 00 | | |
| Boat operations | | 16,016 00 | | 57,150 00 |
| Books and publications | | | 126 00 | |
| Office | | | 295 00 | |
| Household | | | 63 00 | 484 00 |
| Total Marine Fisheries | $205,608 73 | $95,617 00 | $24,596 00 | $325,821 73 |
| Game Conservation: | | | | |
| Field supervision | $72,669 03 | | | |
| Game farms | 116,991 30 | | | |
| Game management | 85,110 59 | | | |
| Headquarters | 21,069 14 | | | |
| Predatory animal control | 103,575 09 | | | $399,415 15 |
| Auto mileage | | $28 00 | | 28 00 |
| Auto | | 58,993 00 | $76,984 00 | 135,977 00 |
| Bounties | | 11,429 00 | | |
| Freight, cartage, express | | 199 00 | | |
| Game foods | | 30,005 00 | | |
| Laboratory supplies | | 1,324 00 | | |
| Light, heat, power | | 14,473 00 | | 57,430 00 |
| Office | | | 1,458 00 | 1,458 00 |
| Operating | | 18,166 00 | 48,041 00 | 66,207 00 |
| Photography | | 440 00 | 270 00 | 710 00 |
| Postage | | 207 00 | | |
| Printing | | 1,884 00 | | |
| Rent of building space | | 5,173 00 | | |
| Rent of equipment | | 4,261 00 | | |
| Repair and maintenance of structures | | 4,341 00 | | |
| Repair of equipment | | 2,525 00 | | |
| Boarding house—subsistence | | 4,065 00 | | |
| Telephone and telegraph | | 2,698 00 | | |
| Travel | | 32,860 00 | | 58,014 00 |
| Less reimbursement for auto operation Pittman-Robertson | | —10,699 00 | | —10,699 00 |
| Household | | | 877 00 | |
| Housing ans subsistence | | | 5,638 00 | 6,515 00 |
| Total Game Conservation | $399,415 15 | $182,372 00 | $133,268 00 | $715,055 15 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Licenses: | | | | |
| Licenses | $39,749 08 | | | $39,749 08 |
| Automobile | | $1,056 43 | $721 50 | 1,777 93 |
| Freight, cartage, express | | 2,910 59 | | |
| License commission paid to agent | | 44,901 27 | | 47,811 86 |
| Office | | 590 25 | 988 26 | 1,578 51 |
| Postage | | 3,438 40 | | |
| Premium on bonds | | 7,878 56 | | |
| Printing | | 22,079 11 | | |
| Rent | | 1,222 25 | | |
| Telephone and telegraph | | 160 18 | | |
| Travel | | 1,701 24 | | 36,479 74 |
| Operating equipment | | | 9 48 | 9 48 |
| Total Licenses | $39,749 08 | $85,938 28 | $1,719 24 | $127,406 60 |
| Total support for Ninety-ninth Fiscal Year | | | | 3,414,447 69 |
| Less estimate maintenance deduction | | | | —15,806 30 |
| Net total support Ninety-ninth Fiscal Year | | | | $3,398,641 39 |
| Special claim for Secretary of State, Board of Control | | $905 36 | | $905 36 |
| Additions and Betterments: | | | | |
| Improvements—Administration: | | | Detail | |
| Office buildings—Redding, Alturas | | | $10,443 00 | |
| Installation of plumbing, air conditioning, etc. | | | 4,000 00 | |
| Patrol and Law Enforcement: | | | | |
| Purchase of boat | | | 118,309 00 | |
| Airplane | | | 30,000 00 | |
| Marine fisheries: | | | | |
| Modernization of heating system | | | 4,500 00 | |
| Alterations of building | | | 1,455 00 | |
| Research vessel | | | 77,612 00 | |
| Fish conservation: | | | | |
| Repairs to Fall Creek Hatchery building | | | 981 00 | |
| Refrigeration facilities, Central Valley | | | 1,714 00 | |
| Central Valley sewer | | | 576 00 | |
| Refrigeration facilities, Fillmore Hatchery | | | 528 00 | |
| Fillmore Hatchery water facility | | | 4,570 00 | |
| Fresno Hatchery experimental fish rearing tanks | | | 987 00 | |
| Hot Creek Hatchery — Remodeling bachelor quarters | | | 973 00 | |
| Kaweah Hatchery—Cabin | | | 1,805 00 | |
| Kern River Hatchery—Refrigeration facilities, etc. | | | 3,449 00 | |
| Lake Almanor Hatchery—Miscellaneous improvements | | | 725 00 | |
| Madera Hatchery—Electrification | | | 408 00 | |
| Mojave River Hatchery—Water pump | | | 1,779 00 | |
| Mojave River Hatchery — Food preparation facilities | | | 637 00 | |
| Mojave River Hatchery—Electric standby unit | | | 4,464 00 | |
| Mt. Shasta Hatchery—Repairs to residence | | | 2,703 00 | |
| Madera Hatchery—Repairs to hatchery buildings | | | 381 00 | |
| Madera Hatchery—Repairs and alterations to living quarters | | | 627 00 | |
| Mt. Tallac Hatchery—Utility building | | | 40 00 | |
| Improved water system—Prairie Creek Hatchery | | | 1,482 00 | |
| Mt. Whitney Hatchery—Bottled gas facility | | | 4,605 00 | |
| Mt. Whitney Hatchery—Pond improvement | | | 3,070 00 | |
| Mt. Whitney Hatchery—Refrigeration facilities, etc. | | | 2,692 00 | |
| Mt. Whitney Hatchery—Repairs to bachelor quarters | | | 1,523 00 | |
| Mt. Whitney Hatchery—Spawning and planting tanks | | | 855 00 | |
| Sequoia Hatchery—Refrigeration facility | | | 1,283 00 | |
| Tahoe Hatchery—Liquid gas installation | | | 634 00 | |
| Whittier Hatchery—Food preparation facility | | | 1,087 00 | |
| Whittier Hatchery—Improvement utility building | | | 300 00 | |
| Yuba River Hatchery—Electrification | | | 241 00 | |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Additions and Betterments—Continued | | | | |
| Game conservation: | | | | |
| Valley Center Game Farm—Pump and well | | | $4,500 00 | |
| Los Banos Refuge—Water facility | | | 2,884 00 | |
| Los Banos Refuge—Alteration to cottage | | | 487 00 | |
| Suisun Refuge—Water supply | | | 337 00 | |
| Tehama winter range fence | | | 817 00 | |
| Food habits and disease laboratory | | | 5,073 00 | |
| Imperial Valley Public Shooting Grounds—Pond and water facility | | | 3,337 00 | |
| Los Banos Game Farm—Pump, well tank and pipe | | | 1,158 00 | |
| Brooder, toolroom and equipment | | | 2,574 00 | |
| Garage and cabin | | | 4,026 00 | |
| Machinery | | | 1,933 00 | |
| Construction of rearing pens for pheasants | | | 4,596 00 | |
| Total improvements | | | | $323,160 00 |
| Total additions and betterments | | | | $323,160 00 |
| Cooperation with Federal Government Pittman-Robertson Act: | | | | |
| 26D-3 restoration of valley quail in Sierra foothills | | | $13,298 25 | |
| Evaluation of quail development and management practice in California | | | 360 87 | |
| 30R-1 study of production, migration and wintering areas of waterfowl in California | | | 3,190 48 | |
| 31R-1 effects of brush removal on game ranges in California | | | 2,768 16 | |
| 28R-1 study of deer population and management problems in California | | | 10,145 50 | |
| 25R-2 food habits of mountain quail, ringnecked pheasant and coyote of California | | | 7,887 43 | |
| 22R-3 life history and management of ringnecked pheasant in California | | | 13,882 02 | |
| 20R-3 survey of waterfowl foodplants | | | 1,099 21 | |
| 19R-3 life history and management of mountain quail in California | | | 6,617 29 | |
| 21L-1 Doyle winter range | | | 29,266 88 | |
| 10L-7 Tehama winter deer range | | | 1,262 65 | |
| 10L-6 Tehama winter deer range | | | 16,742 70 | |
| 26D-2 restoration of valley quail in all south coast ranges | | | 21,200 87 | |
| 18D-1 Beaver transplanting state-wide | | | 3,812 74 | |
| 18D-2 Beaver transplanting | | | 2,172 56 | |
| Total Pittman-Robertson Act | | | | 133,707 61 |
| Less reimbursement from Federal Government for Pittman-Robertson | | | | —100,278 00 |
| Net total Pittman-Robertson Ninty-ninth Fiscal Year | | | | 33,429 61 |
| Contribution to employees retirement fund | | | | 260,000 00 |
| Grand total Fish and Game Preservation Fund Ninty-ninth Fiscal Year | | | | $4,016,136 36 |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

For the Period July 1, 1947, to June 30, 1948

(Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| General fund: | | | | |
| Pacific marine fisheries compact expenses Chapter 1447/47 | | | $11,000 00 | $11,000 00 |
| Wildlife restoration fund: | | | | |
| Support: | | | | |
| Senior stenographer-clerk | $1,242 00 | | | |
| Office | | $3 00 | $581 00 | |
| Printing | | 155 00 | | |
| Telegraph and telephone | | 6 00 | | |
| Traveling | | 984 00 | | |
| Automobile | | 34 00 | 1,671 00 | |
| Rent | | 10 00 | | |
| Pro rata departmental administration | | 125 00 | | |
| Pro rata personnel board service | | 75 00 | | |
| Total support wildlife restoration fund | $1,242 00 | $1,392 00 | $2,252 00 | $4,886 00 |
| Capital Outlay—Construction, improvements, repairs and equipment: | | | | |
| Marine fisheries: | | | | |
| Deer Creek fish screens | | | $3,575 00 | |
| Preliminary work architectural service | | | 5,000 00 | |
| Total marine fisheries | | | $8,575 00 | $8,575 00 |
| Wildlife Restoration Fund: | | | | |
| Capital outlay—Contruction, improvement, repairs and equipment: | | | | |
| Fish conservation: | | | | |
| Crystal Lake Hatchery: | | | | |
| Improvement to ponds | | | $5,271 00 | |
| Miscellaneous improvement | | | 1,838 00 | |
| Repair to ranch house | | | 682 00 | |
| Refrigeration facility | | | 1,017 00 | |
| Building and miscellaneous development | | | 115,000 00 | |
| Total fish conservation | | | $123,808 00 | |
| Game conservation: | | | | |
| Brawley Game Farm: | | | | |
| Rearing and holding pens | | | $5,146 00 | |
| Pump, well, tank and pipe | | | 954 00 | |
| Brooders, toolroom and equipment | | | 2,753 00 | |
| Cabin and garage | | | 2,384 00 | |
| Incubator | | | 2,562 00 | |
| Chico Game Farm: | | | | |
| Rearing and holding pens | | | 4,931 00 | |
| Brooders, toolroom and equipment | | | 3,767 00 | |
| Cabin and garage | | | 3,459 00 | |
| Machinery | | | 3,110 00 | |
| Marysville Game Farm: | | | | |
| Rearing and holding pens | | | 4,711 00 | |
| Pump, well, tank pipe and hardware | | | 3,726 00 | |
| Brooders, feed room, toolroom and miscellaneous equipment | | | 2,540 00 | |
| Cabin and garage | | | 1,787 00 | |
| Porterville Game Farm: | | | | |
| Rearing and holding pens | | | 2,727 00 | |
| Pump, well, tank, pipe and hardware | | | 2,283 00 | |
| Brooders, toolroom and equipment | | | 1,992 00 | |
| Coast Counties Quail Habitat: | | | | |
| Quonset type hut | | | 2,242 00 | |
| Water and feed facilities | | | 613 00 | |
| Southern California Quail Development: | | | | |
| Salaries and wages | | | 1,023 00 | |
| Operating expenses | | | 1,126 00 | |
| Equipment | | | 13,147 00 | |

## STATEMENT OF EXPENDITURES (COMPLETE) BY OBJECT—Continued

### For the Period July 1, 1947, to June 30, 1948

### (Ninety-ninth Fiscal Year)—Continued

| Function | Salaries and wages | Operating expenses | Equipment | Total |
|---|---|---|---|---|
| Wildlife Restoration Fund—Continued | | | | |
| Capital Outlay—Construction, Improvements, Repairs, and Equipment—Continued | | | | |
| Game Conservation—Continued | | | | |
| Honey Lake Waterfowl Management Area: | | | | |
| Fleming Ranch—Improvements to reservoir, dam and bed | | | $1,080 00 | |
| Improvements to water control: | | | | |
| Facilities and pond development: | | | | |
| Reservoir field | | | 3,078 00 | |
| New road fields | | | 3,332 00 | |
| Upper lake fields | | | 727 00 | |
| Lower lake fields | | | 2,290 00 | |
| Dakin Ranch—Harston reservoir flood channel | | | 2,060 00 | |
| Dakin Ranch—Miscellaneous projects | | | 1,838 00 | |
| Imperial Valley Public Shooting Grounds: | | | | |
| Land leveling and lease | | | 11,998 00 | |
| Development of south pumice unit | | | 1,250 00 | |
| Development of north pumice unit | | | 4,500 00 | |
| Madeline Plains Waterfowl Development: | | | | |
| Garage and workshop | | | 2,974 00 | |
| Water control facilities | | | 1,614 00 | |
| Miscellaneous improvements to buildings and grounds | | | 510 00 | |
| Fencing | | | 2,533 00 | |
| Delivery ditch improvement | | | 4,560 00 | |
| Pump and well | | | 1,000 00 | |
| Total Game Conservation | | | $117,327 00 | |
| Total construction, improvements, repairs and equipment | | | $249,710 00 | |
| Contributions to state employees retirement system | | | $117 00 | $117 00 |
| Total Wildlife Restoration Fund | | | | $254,713 00 |

## ARRESTS, FINES AND SEIZURES


Page

1. Total Arrests Over 46 Years ..... 105
2. Recapitulation, Arrests and Convictions ..... 105
3. Seizure of Fish and Game (Fish) ..... 106
4. Seizure of Fish and Game (Game) ..... 106
5. Fish Cases ..... 107
6. Game Cases ..... 108


### TOTAL ARRESTS FOR PERIOD OF 46 YEARS

| | | | |
|---|---|---|---|
| 1902-1904 | 550 | 1926-1928 | 4,390 |
| 1904-1906 | 774 | 1928-1930 | 5,388 |
| 1906-1908 | 1,192 | 1930-1932 | 5,237 |
| 1908-1910 | 1,771 | 1932-1934 | 3,795 |
| 1910-1912 | 2,063 | 1934-1936 | 4,535 |
| 1912-1914 | 1,993 | 1936-1938 | 6,382 |
| 1914-1916 | 2,087 | 1938-1940 | 7,444 |
| 1916-1918 | 1,797 | 1940-1942 | 7,262 |
| 1918-1920 | 1,891 | 1942-1944 | 4,298 |
| 1920-1922 | 2,258 | 1944-1946 | 5,902 |
| 1922-1924 | 2,715 | 1946-1948 | 11,331 |
| 1924-1926 | 3,207 | | |

### ARRESTS AND CONVICTIONS RECAPITULATION

| | Number of arrests | Fines imposed | Jail sentences (days) |
|---|---|---|---|
| Fish cases 1946-1947 | 2,977 | $100,817 50 | 1,828 |
| Game cases 1946-1947 | 2,374 | $129,132 00 | 1,700½ |
| Totals 1946-1947 | 5,351 | $229,949 50 | 3,528½ |
| Fish cases 1947-1948 | 3,492 | $97,704 00 | 169½ |
| Game cases 1947-1948 | 2,488 | $148,713 50 | 2,509½ |
| Totals 1947-1948 | 6,980 | $246,417 50 | 2,679 |
| Recapitulation: | | | |
| 1946-1947 | 5,351 | $229,949 50 | 3,528½ |
| 1947-1948 | 6,980 | $246,417 50 | 2,679 |
| Totals | 11,331 | $476,367 00 | 6,207½ |

## SEIZURES OF FISH AND GAME

### FISH CASES

| | July 1, 1946 to June 30, 1947 | July 1, 1947 to June 30, 1948 | Total |
|---|---|---|---|
| Fish | | | |
| Abalones | 5,344 | 3,366 | 8,710 |
| Abalones, pounds | 1,237½ | 3,659 | 4,896½ |
| Bass | 343 | 926 | 1,269 |
| Bass, pounds | 1,251 | 4,260 | 5,511 |
| Barracuda | 208 | 71 | 279 |
| Barracuda, pounds | 4,062 | 2,112 | 6,174 |
| Catfish | 288 | 410 | 698 |
| Catfish, pounds | 250 | 598 | 848 |
| Clams | 3,641 | 18,303 | 21,944 |
| Cockles | 10,573 | 22,559 | 33,132 |
| Carp | 114 | 7 | 121 |
| Carp, pounds | ---- | 500 | 500 |
| Crabs | 908 | 216 | 1,124 |
| Crabs, pounds | ---- | 1,200 | 1,200 |
| Crappie | 57 | 40 | 97 |
| Bonito, pounds | ---- | 115 | 115 |
| Halibut | 1 | 5 | 6 |
| Lobsters | 1,995 | 411 | 2,406 |
| Lobsters, pounds | 7,522½ | 8,162 | 15,684½ |
| Mackerel and sardines, pounds | 40 | 1,027,795 | 1,027,830 |
| Octopus | 9 | ---- | 9 |
| Rock bass | 47 | ---- | 47 |
| Salmon | 79 | 73 | 152 |
| Salmon, pounds | 1,362 | 386 | 1,748 |
| Seallops | ---- | 144 | 144 |
| Sturgeon | 1 | 1 | 2 |
| Sturgeon, pounds | 10 | ---- | 10 |
| Sunfish | 135 | 1,852 | 1,987 |
| Sunfish, pounds | ---- | 45 | 45 |
| Suckers | ---- | 68 | 68 |
| Trout | 1,207 | 1,459 | 2,666 |
| Trout, pounds | 4,856 | 196 | 5,052 |
| Yellowfin croaker | ---- | 20 | 20 |
| Yellowfin croaker, pounds | ---- | 300 | 300 |
| Skipjack | ---- | 7,680 | 7,680 |

### GAME CASES

| | July 1, 1946 to June 30, 1947 | July 1, 1947 to June 30, 1948 | Total |
|---|---|---|---|
| Game | | | |
| Bear | 1 | 1 | 2 |
| Bear meat, pounds | ---- | 135 | 135 |
| Antelope | ---- | 1 | 1 |
| Coots | 35 | 33 | 68 |
| Deer | 109 | 143 | 252 |
| Deer meat, pounds | 5,931 | 2,940 | 8,871 |
| Doves | 411 | 841 | 1,252 |
| Ducks | 623 | 1,340 | 1,963 |
| Gallinule | ---- | 1 | 1 |
| Grouse | ---- | 1 | 1 |
| Geese | 145 | 149 | 294 |
| Frogs | 379 | 139 | 518 |
| Hamsters | 13 | ---- | 13 |
| Pheasants | 307 | 251 | 558 |
| Quail | 141 | 68 | 209 |
| Rabbits | 180 | 145 | 325 |
| Sagehens | 7 | ---- | 7 |
| Seagulls | 4 | 3 | 7 |
| Shorebirds | 29 | 76 | 105 |
| Squirrels | 9 | 22 | 31 |
| Swan | 1 | 12 | 13 |
| Non-game | 36 | 27 | 63 |
| Antelope meat, pounds | 35 | ---- | 35 |
| Pine marten | ---- | 7 | 7 |
| Pigeons | 1 | 35 | 36 |

## FISH CASES

| Offense | July 1, 1946, to June 30, 1947 | | | July 1, 1947, to June 30, 1948 | | |
|---|---|---|---|---|---|---|
| | Arrests | Fines | Jail | Arrests | Fines | Jail |
| Abalones: Undersize; over limit; out of shell; no license; failure to show; taking to sell commercially | 576 | $18,495 00 | 35 | 483 | $14,174 00 | 40¼ |
| Angling: Failure to show license; closed stream; set line; spearing; gaffing 300′ of stream; no license; using another's license; shooting fish; nonresident using resident license; night fishing; use of explosives; using traps; back dating license; game fish for bait | 606 | 12,047 00 | 755 | 1,240 | 21,821 50 | 27½ |
| Bass: Night fishing; selling and buying striped bass; under size; overlimit; possession closed season; undersize for bait; early fishing; late fishing; seining | 478 | 13,729 50 | 4 | 354 | 10,262 00 | 6 |
| Barracuda: No license; overlimit; on boat with purse seine net; sale of undersize | 1 | 5 00 | | 12 | 400 00 | |
| Catfish: Closed season; undersize; overlimit; selling and purchasing undersize; set lines | 12 | 1,572 50 | | 28 | 520 00 | |
| Chumming: Inland waters; for trout with cluster salmon eggs | 7 | 275 00 | | 16 | 730 00 | |
| Clams: Undersize; overlimit; closed season; out of shell; early and late clamming | 341 | 10,778 00 | 529 | 524 | 13,104 00 | 79½ |
| Crappie: Overlimit; closed season; seining | 27 | 402 00 | | 11 | 225 00 | |
| Crabs: Undersize; overlimit; failure to issue market receipts; taking on Sunday | 39 | 3,830 00 | | 19 | 925 00 | |
| Cockles: Overlimit; undersize; failure to show | 22 | 510 00 | | 78 | 1,990 00 | |
| Bluegill: Closed season; overlimit; netting | 131 | 3,608 00 | | 139 | 3,568 50 | |
| Croakers: Illegal sale; round haul net | 4 | 200 00 | | 3 | 150 00 | |
| Perch: No license; closed season; selling without tags | 2 | 60 00 | | 2 | 35 00 | |
| Lobsters: Overlimit; undersize; closed season; traps closed district; selling oversize; possession unpunched; no boat registration | 65 | 3,570 00 | | 54 | 2,787 00 | |
| Salmon: Undersize; closed season; spawning bed; snagging; shooting; gaffing; drift gill net; night fishing | 26 | 7,441 00 | | 115 | 2,473 00 | 16 |
| Sturgeon: Possession | 1 | 75 00 | | | | |
| Scallops: Taking, no license | | | | 1 | 20 00 | |
| Trout: Closed season; set line; closed stream; overlimit; untagged for sale; spearing at night; chumming with salmon eggs; use of explosives; within 300′ mouth of stream | 390 | 11,344 50 | 505 | 153 | 5,328 00 | |
| Seals: Shooting | 1 | 25 00 | | 3 | 75 00 | |
| Commercial: Illegal diving; no license; trawl net closed area; failure to keep records; operating lampara net closed area; illegal gill net; failure to keep log; round haul net District 19A; failure to pay privilege tax; operating beach seine District 4; fyke nets, closed district; fish wastage; no packers' license; failure to register with Fish and Game; oversize mesh; failure to show license on demand | 203<br>2 | 8,825 00<br>300 00 | | 174 | 10,451 00 | |
| Pollution: Oil; sawdust; edgings; tannic acid; sewage; fish refuse | 42 | 3,700 00 | | 58 | 8,475 00 | |
| Mackerel and Sardines: Using more than 32½% in reduction; more than 25% small size; delivering and receiving undersize | 1 | 25 00 | | 25 | 190 00 | |
| Totals | 2,977 | $100,817 50 | 1,828 days | 3,492 | $97,704 00 | 169½ days |

## GAME CASES

| Offense | July 1, 1946, to June 30, 1947 | | | July 1, 1947, to June 30, 1948 | | |
|---|---|---|---|---|---|---|
| | Arrests | Fines | Jail | Arrests | Fines | Jail |
| Antelope: Closed season | 1 | | | 1 | | |
| Bear: Closed season | | | | 3 | 50 00 | |
| Beaver | 2 | 100 00 | | | | |
| Coots: Closed season; shooting from auto; rifle; no license | 21 | 490 00 | | 21 | 385 00 | |
| Deer: Closed season; spike buck; spotlighting; failure to tag properly; doe; taking in refuge; altering tag; illegal possession; second deer district 1; failure to keep hides; transferring tag; .22 rifle; killing fawn; taking forked horn; no tags; possessing tags issued to another; purchase of fawn; selling fawn; overlimit | 504 | 49,954 50 | 848 | 444 | 53,135 50 | 993 |
| Deer Meat: Closed season; illegal possession; unmarked; no entry permit; sale; yearling; spike buck | 101 | 8,951 00 | 624½ | 127 | 15,279 00 | 1,137 |
| Doves: Closed season; overlimit; failure to show license; unplugged gun; taking from motor vehicle; early and late shooting; .22 rifle | 162 | 4,855 00 | | 223 | 7,079 00 | 8 |
| Ducks: Closed season; unplugged gun; overlimit; offering for sale; in refuge; late shooting; shooting from motor boat; no license; failure to show | 212 | 9,842 00 | | 448 | 20,191 50 | 180 |
| Frogs: Under size; overlimit; closed season | 6 | 170 00 | | 19 | 520 00 | |
| Elk: Illegal possession | 1 | 200 00 | | | | |
| Geese: Overlimit; late shooting; keeping in captivity | 35 | 1,370 00 | | 67 | 2,032 00 | |
| Grouse: Possession | 1 | 25 00 | | 2 | 75 00 | |
| Grebe: Possession | 2 | 35 00 | | 2 | 50 00 | |
| Gallinule: Closed season | | | | 1 | 75 00 | |
| Pheasants: Closed season; hen; early shooting; from vehicle; overlimit; .22 rifle; selling untagged | 351 | 26,987 00 | 193 | 206 | 11,470 00 | |
| Quail: Closed season; overlimit; trapping; unplugged gun | 66 | 2,784 50 | | 52 | 1,431 00 | |
| Rabbit: Closed season; no license; taking at night; operating snares | 140 | 3,785 50 | | 33 | 765 00 | |
| Pigeons: Closed season; overlimit | 2 | 50 00 | | 23 | 795 00 | 30 |
| Nongame: No permit; trapping; possession | 46 | 1,576 00 | 32 | 31 | 827 50 | 20 |
| Swan: Possession; killing | 5 | 97 50 | | 18 | 680 00 | |
| Shorebirds | 21 | 842 50 | | 32 | 825 00 | |
| Hunting: No license; night hunting; in refuge; closed season; shooting from motor boat; early and late shooting; transferance of license; resident license used by nonresident; unplugged gun; shooting from auto; posted land | 684 | 16,839 50 | 3 | 637 | 30,133 00 | 141½ |
| Trespass: In refuge | 1 | 25 00 | | 29 | 615 00 | |
| Trapping: No license; harboring game birds; removing animals from state trapper's trap | 8 | 87 00 | | 3 | 120 00 | |
| Fur Bearing Mammals: Bear: closed season; Marten: closed season | 2 | 65 00 | | 4 | 135 00 | |
| Deer Tags: Possession other than own; failure to validate; failure to carry; "A" tag in one-deer district; altering | | | | 62 | 2,045 00 | |
| Totals | 2,374 | $129,132 00 | 1,700½ days | 2,488 | $148,713 50 | 2,509½ days |

## MARINE FISHERIES STATISTICS

Page
1. California Fisheries Production ..... 109
2. Pounds and Value of Commercial Fish Landings in California ..... 109
3. Nationality of Commercial Fishermen ..... 110
4. Residence of Licensed Commercial Fishermen ..... 110
5. Tuna Catch in Pounds ..... 111
6. Catches of Bottom Fish, in Pounds ..... 111

### TABLE 1

**California Fisheries Production**

| | 1946 | 1947 | Total |
|---|---|---|---|
| Total landings, pounds | 919,334,000 | 795,092,000 | 1,714,426,000 |
| Cases of fish canned | 9,085,235 | 10,243,991 | 19,329,226 |
| Tons of fish meal produced | 52,895 | 37,065 | 89,960 |
| Gallons of fish oil produced | 4,902,625 | 2,633,604 | 7,536,229 |
| Gallons of liver oil produced | 169,586 | 221,557 | 391,143 |
| Value of canned and processed fishery products | $102,420,392 | $132,721,357 | $235,141,749 |

### TABLE 2

**Pounds and Value of Commercial Fish Landings in California**

| Species | 1946 | | 1947 | |
|---|---|---|---|---|
| | Pounds | Value | Pounds | Value |
| Yellowfin tuna | 127,247,000 | $14,614,000 | 150,459,000 | $23,445,000 |
| Skipjack | 41,088,000 | 4,283,000 | 52,462,000 | 7,586,000 |
| Sardine | 510,759,000 | 6,853,000 | 255,514,000 | 5,802,000 |
| Jack mackerel | 15,093,000 | 327,000 | 129,048,000 | 3,323,000 |
| Bluefin tuna | 22,032,000 | 2,246,000 | 20,838,000 | 3,321,000 |
| Albacore | 18,068,000 | 3,587,000 | 13,427,000 | 3,140,000 |
| Salmon | 13,658,000 | 2,375,000 | 11,445,000 | 2,265,000 |
| Bonito | 5,626,000 | 536,000 | 13,697,000 | 1,606,000 |
| Pacific mackerel | 53,875,000 | 1,431,000 | 46,478,000 | 1,390,000 |
| Shark | 1,605,000 | 1,615,000 | 2,638,000 | 1,325,000 |
| Crab | 9,641,000 | 1,319,000 | 10,733,000 | 1,305,000 |
| Yellowtail | 4,562,000 | 374,000 | 9,953,000 | 1,124,000 |
| Sole | 10,569,000 | 506,000 | 12,334,000 | 628,000 |
| Spiny lobster | 1,918,000 | 611,000 | 1,763,000 | 513,000 |
| Rockfish | 11,173,000 | 552,000 | 8,499,000 | 416,000 |
| Squid | 38,025,000 | 1,215,000 | 14,543,000 | 391,000 |
| Barracuda | 3,107,000 | 399,000 | 2,666,000 | 351,000 |
| California halibut | 2,500,000 | 433,000 | 1,839,000 | 339,000 |
| Anchovy | 1,922,000 | 43,000 | 18,941,000 | 335,000 |
| Broadbill swordfish | 859,000 | 269,000 | 1,010,000 | 322,000 |
| Abalone | 2,096,000 | 254,000 | 2,670,000 | 307,000 |
| White sea bass | 616,000 | 117,000 | 1,083,000 | 231,000 |
| Ling cod | 1,156,000 | 102,000 | 1,941,000 | 163,000 |
| Catfish | 410,000 | 108,000 | 299,000 | 85,000 |
| Sablefish | 2,659,000 | 256,000 | 902,000 | 77,000 |
| Northern halibut | 358,000 | 71,000 | 231,000 | 54,000 |
| Shrimp | 437,000 | 22,000 | 843,000 | 51,000 |
| All other | 18,272,000 | 828,000 | 8,836,000 | 552,000 |
| Totals | 919,334,000 | $45,346,000 | 795,092,000 | $60,447,000 |

## TABLE 3

### Nationality of Commercial Fishermen

| Nativity | 1946-47 | 1947-48 |
|---|---|---|
| United States | 8,513 | 9,058 |
| Italy | 1,339 | 1,362 |
| Jugoslavia | 736 | 782 |
| Norway | 454 | 454 |
| Portugal | 370 | 378 |
| Great Britain | 198 | 172 |
| Sweden | 92 | 96 |
| Spain | 60 | 56 |
| Denmark | 59 | 58 |
| Finland | 51 | 63 |
| Philippine Islands | 50 | 38 |
| Germany | 49 | 51 |
| Mexico | 48 | 57 |
| Greece | 47 | 53 |
| Russia | 38 | 38 |
| Austria | 21 | 21 |
| All others | 187 | 157 |
| Totals | 12,312 | 12,894 |

## TABLE 4

### Residence of Licensed Commercial Fishermen

| Region of residence | 1946-47 | 1947-48 |
|---|---|---|
| Eureka | 845 | 856 |
| Sacramento | 671 | 672 |
| San Francisco | 1,384 | 1,312 |
| Monterey | 1,294 | 1,372 |
| Santa Barbara | 569 | 617 |
| Los Angeles | 4,741 | 4,970 |
| San Diego | 2,127 | 2,405 |
| Alaska, Oregon, Washington | 666 | 676 |
| Mexico | 15 | 14 |
| Totals | 12,312 | 12,894 |

## TABLE 5

### Tuna Catch in Pounds

| Species | 1946 | 1947 |
|---|---|---|
| Yellowfin | 127,247,000 | 150,459,000 |
| Skipjack | 41,088,000 | 52,462,000 |
| Bluefin | 22,032,000 | 20,838,000 |
| Bonito | 5,626,000 | 13,697,000 |
| Albacore | 18,068,000 | 13,427,000 |
| Totals | 214,061,000 | 250,883,000 |

## TABLE 6

### Catches of Bottom Fish, in Pounds

| Species | 1946 | 1947 |
|---|---|---|
| Flatfish: | | |
| Sole | 10,569,000 | 12,334,000 |
| Sand dab | 679,000 | 701,000 |
| Starry flounder | 509,000 | 527,000 |
| Turbot | 50,000 | 102,000 |
| Rockfish (rock cod) | 11,173,000 | 8,499,000 |
| Sablefish (black cod) | 2,659,000 | 902,000 |
| Ling cod | 1,156,000 | 1,941,000 |
| Totals | 26,795,000 | 25,006,000 |

## TABLE 1. FISH PLANTED—1946

### Hatchery Reared Fish Planted in Each County

| County | Trout | | | | | Salmon, King | Total number of fish |
|---|---|---|---|---|---|---|---|
| | Rainbow | Steelhead | Cutthroat | Eastern brook | Brown | | |
| Alpine | 105,490 | | 50,000 | 63,700 | | | 219,190 |
| Amador | 195,500 | | | 75,000 | | | 270,500 |
| Butte | 618,500 | | | 3,400 | | | 621,900 |
| Calaveras | 108,800 | | | | | | 108,800 |
| Del Norte | 21,050 | 502,596 | | | | 496,080 | 1,019,726 |
| El Dorado | 1,205,130 | | | 407,060 | | | 1,612,190 |
| Fresno | 947,920 | | | 187,060 | | | 1,134,980 |
| Humboldt | 64,856 | 367,920 | | 3,011 | | 2,700 | 438,487 |
| Inyo | 575,208 | | | 145,939 | 235,170 | | 956,317 |
| Kern | 63,507 | | | | | | 63,507 |
| Lassen | 343,630 | | | 110,650 | | | 454,280 |
| Los Angeles | 164,475 | | | | | | 164,475 |
| Madera | 172,525 | | | 10,040 | | | 182,565 |
| Marin | 30,800 | 1,960 | | | | | 32,760 |
| Mariposa | 554,701 | | | 51,660 | 101,925 | | 708,286 |
| Merced | 61,162 | | | | | | 61,162 |
| Modoc | 378,920 | | | | 30,000 | | 408,920 |
| Mono | 925,145 | | 897,982 | 290,970 | 198,090 | | 2,312,187 |
| Monterey | 41,310 | 31,250 | | | | | 72,560 |
| Napa | 100,000 | | | | | | 100,000 |
| Nevada | 667,552 | | | 268,334 | | | 935,886 |
| Orange | 9,650 | | | | | | 9,650 |
| Placer | 519,105 | | | 135,584 | | | 684,689 |
| Plumas | 1,287,340 | | | 112,360 | | | 1,399,700 |
| Riverside | 23,650 | | | | | | 23,650 |
| San Bernardino | 287,560 | | | | | | 287,560 |
| San Diego | 27,550 | | | | | | 27,550 |
| San Francisco | 115,800 | | | | | | 115,800 |
| San Luis Obispo | 17,850 | | | | | | 17,850 |
| San Mateo | 15,550 | 65,700 | | | | | 81,250 |
| Santa Barbara | 7,620 | | | | | | 7,620 |
| Santa Clara | 221,783 | | | | | | 221,783 |
| Santa Cruz | 57,929 | 166,274 | | | | | 224,203 |
| Shasta | 963,330 | | | 55,960 | 109,250 | | 1,128,540 |
| Sierra | 556,070 | | | 136,480 | | | 692,550 |
| Siskiyou | 606,950 | 394,986 | | 97,028 | | 3,265,073 | 4,364,037 |
| Tehama | 393,300 | | | 25,000 | | | 418,300 |
| Trinity | 321,400 | | | 74,720 | | | 396,120 |
| Tulare | 671,721 | | | 167,404 | | | 839,125 |
| Tuolumne | 604,577 | | | 185,962 | 41,370 | | 831,909 |
| Ventura | 72,750 | | | | | | 72,750 |
| Yuba | 63,120 | | | | | | 63,120 |
| Grand totals | 14,220,786 | 1,530,686 | 947,982 | 2,607,322 | 715,805 | 3,763,853 | 23,786,434 |

## TABLE 2

### Hatchery Reared Warm-water Fishes—1946

| | Number of fish |
|---|---|
| Largemouth bass | 14,549 |
| Sacramento perch | 23,040 |
| Bluegill sunfish | 1,638 |
| Total | 39,227 |

## TABLE 3

### Fish Rescued—1946

| Trout | |
|---|---|
| Steelhead | 1,290,620 |
| Brown | 8 |
| Total | 1,290,628 |

| Salmon | |
|---|---|
| King | 383,581 |
| Silver | 135,090 |
| Total | 518,671 |

| Warm-water Fishes | |
|---|---|
| Smallmouth black bass | 51,717 |
| Largemouth black bass | 50,558 |
| Spotted bass | 15,900 |
| Striped bass | 113 |
| Sacramento perch | 50,000 |
| Crappie | 48,901 |
| Squaretail catfish | 290,138 |
| Forkedtail catfish | 388,469 |
| Bluegill sunfish | 85,680 |
| Green sunfish | 285,524 |
| Warmouth | 70,008 |
| Sturgeon | 4 |
| Total | 1,337,012 |

## TABLE 1. FISH PLANTED—1947

### Hatchery Reared Fish Planted in Each County

| County | Trout | | | | | Salmon | | Total number of fish |
|---|---|---|---|---|---|---|---|---|
| | Rainbow | Steelhead | Cutthroat | Eastern brook | Brown | King | Kokanee | |
| Alpine | 194,100 | | 149,100 | 74,600 | | | | 417,800 |
| Amador | 144,000 | | | | | | | 144,000 |
| Butte | 601,800 | | | | 15,000 | | | 616,800 |
| Calaveras | 144,696 | | | | | | | 144,696 |
| Del Norte | 27,550 | 346,900 | | | | 470,700 | | 845,150 |
| El Dorado | 1,452,162 | | | 201,410 | | | 75,000 | 1,728,572 |
| Fresno | 1,012,549 | | | 129,990 | | | | 1,142,539 |
| Glenn | 12,600 | | | | | | | 12,600 |
| Humboldt | 64,235 | 246,055 | 33,610 | 2,600 | | 25,200 | | 371,700 |
| Inyo | 568,252 | | | 146,290 | 19,750 | | | 734,292 |
| Kern | 129,070 | | | | | | | 129,070 |
| Lassen | 599,480 | | | 43,900 | 14,580 | | | 657,960 |
| Los Angeles | 253,500 | | | | | | | 253,500 |
| Madera | 315,702 | | | 64,202 | | | | 379,904 |
| Marin | 33,320 | | | | | | | 33,320 |
| Mariposa | 633,717 | | | 19,200 | 103,600 | | | 756,517 |
| Merced | 47,840 | | | | | | | 47,840 |
| Modoc | 402,240 | | | | | | | 402,240 |
| Mono | 1,068,157 | | 180,800 | 407,301 | 381,690 | | | 2,037,948 |
| Monterey | 40,205 | 14,512 | | | | | | 54,717 |
| Napa | 108,015 | | | | | | | 108,015 |
| Nevada | 1,117,862 | | | 194,271 | | | 100,000 | 1,412,133 |
| Orange | 4,350 | | | | | | | 4,350 |
| Placer | 909,520 | | | 63,572 | | | | 973,092 |
| Plumas | 1,188,020 | | | 22,000 | 80,000 | | | 1,290,020 |
| Riverside | 55,150 | | | | | | | 55,150 |
| San Bernardino | 384,176 | | | | | | | 384,176 |
| San Diego | 45,000 | | | | | | | 45,000 |
| San Luis Obispo | 21,400 | | | | | | | 21,400 |
| San Mateo | 13,532 | | | | | | | 13,532 |
| Santa Barbara | 32,850 | | | | | | | 32,850 |
| Santa Clara | 31,500 | | | | | | | 31,500 |
| Santa Cruz | 36,685 | 141,452 | | | | | | 178,137 |
| Shasta | 1,310,309 | | | 17,160 | 129,890 | | | 1,457,359 |
| Sierra | 648,772 | | | 40,190 | | | | 688,962 |
| Siskiyou | 1,093,885 | 343,240 | | 92,820 | | 3,237,150 | | 4,767,095 |
| Solano | 15,000 | | | | | | | 15,000 |
| Tehama | 315,600 | | | 10,000 | 60,000 | | | 385,600 |
| Trinity | 536,078 | 21,600 | | 15,240 | | | | 572,918 |
| Tulare | 880,726 | | | 113,052 | | | | 993,778 |
| Tuolumne | 602,589 | | | 95,220 | 76,720 | | 282,800 | 1,057,329 |
| Ventura | 54,120 | | | | | | | 54,120 |
| Yuba | 49,300 | | | | | | | 49,300 |
| Grand totals | 17,199,614 | 1,113,759 | 363,510 | 1,753,018 | 881,230 | 3,733,050 | 457,800 | 25,501,981 |

## TABLE 2

### Hatchery Reared Warm-water Fishes—1947

| | Number of fish |
|---|---|
| Smallmouth bass | 109,222 |
| Largemouth bass | 9,234 |
| Sacramento perch | 1,220 |
| Bluegill sunfish | 19,765 |
| Total | 139,441 |

## TABLE 3

### Fish Rescued—1947

| Trout | |
|---|---|
| Rainbow | 70 |
| Steelhead | 482,101 |
| Brown | 1,560 |
| Total | 483,731 |

| Salmon | |
|---|---|
| King | 5,569 |
| Silver | 14,015 |
| Total | 19,584 |

| Warm-water Fishes | |
|---|---|
| Black spotted bass | 787 |
| Smallmouth bass | 110,770 |
| Largemouth bass | 77,065 |
| Green sunfish | 4,941 |
| Bluegill sunfish | 52,350 |
| Forkedtail catfish | 65,031 |
| Squaretail catfish | 188,787 |
| Crappie | 47,834 |
| Sacramento perch | 1,224 |
| Warmouth bass | 16,046 |
| Striped bass | 4,954 |
| Shad | 4,000 |
| Total | 573,789 |

## GAME STATISTICS

Page

1. Twenty-one Year Record of Deer Kill ..... bet. 116-117
2. Record of Mountain Lion Bounties Paid by Division of Fish and Game ..... bet. 116-117
3. Predatory Animal Catch by Counties ..... 117
4. Game Bird Releases ..... 118

## PREDATORY ANIMAL CATCH BY COUNTIES

| | July 1, 1946 to June 30, 1947 | | | | July 1, 1947 to June 30, 1948 | | | | Total for biennium |
|---|---|---|---|---|---|---|---|---|---|
| | Coyote | Bobcat | Other predators | Total | Coyote | Bobcat | Other predators | Total | |
| Alpine | 42 | 3 | | 45 | 10 | 1 | | 11 | 56 |
| Amador | 62 | 10 | | 72 | 43 | 7 | 14 | 64 | 136 |
| Butte | 111 | 3 | 281 | 395 | 98 | 8 | 196 | 302 | 697 |
| Calaveras | 3 | 1 | 1 | 5 | 53 | 11 | 1 | 65 | 70 |
| Colusa | 6 | 6 | | 12 | 3 | 1 | 2 | 6 | 18 |
| El Dorado | 43 | 9 | 1 | 53 | 15 | | 4 | 19 | 72 |
| Fresno | 201 | 58 | 85 | 344 | 257 | 1,272 | 633 | 1,017 | 1,361 |
| Glenn | 27 | 5 | | 32 | 3 | 2 | | 5 | 37 |
| Humboldt | 32 | 120 | 12 | 164 | 56 | 121 | 33 | 210 | 374 |
| Imperial | | | | | 7 | | 91 | 98 | 98 |
| Inyo | 104 | 3 | 4 | 111 | 122 | 2 | | 124 | 235 |
| Kern | 145 | 22 | 17 | 184 | 8 | 1 | 13 | 22 | 206 |
| Kings | 8 | 2 | | 10 | | | | | 10 |
| Lake | 51 | 10 | | 61 | 48 | 39 | | 87 | 148 |
| Lassen | 451 | 50 | 151 | 652 | 649 | 39 | 77 | 765 | 1,417 |
| Los Angeles | 117 | 22 | 62 | 201 | 267 | 72 | 169 | 508 | 709 |
| Madera | 2 | | | 2 | 58 | 28 | 28 | 114 | 116 |
| Mariposa | 18 | 9 | 38 | 65 | 89 | 6 | 20 | 115 | 180 |
| Mendocino | | | | | | 46 | 219 | 265 | 265 |
| Merced | 1 | 1 | 12 | 14 | 1 | 1 | 12 | 14 | 28 |
| Modoc | 26 | 1 | | 27 | 96 | 6 | | 102 | 129 |
| Mono | 99 | 6 | 3 | 108 | 71 | 3 | 3 | 77 | 185 |
| Monterey | 148 | 89 | 70 | 307 | 5 | 24 | 43 | 72 | 379 |
| Nevada | 13 | 1 | 1 | 15 | 54 | 7 | 29 | 90 | 105 |
| Orange | 44 | 76 | 8 | 128 | 14 | 12 | 21 | 47 | 175 |
| Plumas | 96 | 8 | 1 | 105 | 247 | 17 | | 264 | 369 |
| Riverside | 217 | 45 | 31 | 293 | 196 | 36 | 19 | 251 | 544 |
| Sacramento | | | | | 3 | | | 3 | 3 |
| San Benito | 125 | 101 | 163 | 389 | 63 | 150 | 231 | 444 | 833 |
| San Bernardino | 291 | 104 | 47 | 442 | 232 | 95 | 94 | 421 | 863 |
| San Diego | 194 | 111 | 157 | 462 | 289 | 172 | 209 | 670 | 1,132 |
| San Luis Obispo | 171 | 119 | 221 | 511 | 109 | 115 | 466 | 690 | 1,201 |
| Santa Barbara | 368 | 37 | 21 | 426 | 204 | 41 | 6 | 251 | 677 |
| Santa Clara | | | | | 4 | 4 | 18 | 26 | 26 |
| Santa Cruz | 4 | 3 | 4 | 11 | 47 | 59 | 257 | 363 | 374 |
| Shasta | 118 | 19 | 11 | 148 | 78 | 16 | | 94 | 242 |
| Sierra | 3 | 1 | 2 | 6 | 3 | | | 3 | 9 |
| Siskiyou | 39 | 11 | 2 | 52 | 90 | 16 | 24 | 130 | 182 |
| Solano | | | 23 | 23 | | | | | 23 |
| Stanislaus | 58 | 15 | 21 | 94 | 28 | 23 | 26 | 77 | 171 |
| Tehama | 69 | 4 | | 73 | 77 | 23 | | 100 | 173 |
| Trinity | 12 | 8 | | 20 | 44 | 8 | | 52 | 72 |
| Tulare | 95 | 28 | 226 | 349 | 318 | 31 | 261 | 610 | 959 |
| Tuolumne | 192 | 25 | | 217 | 165 | 35 | 3 | 203 | 420 |
| Ventura | 265 | 42 | 16 | 323 | 211 | 48 | 15 | 275 | 598 |
| Yolo | 3 | 3 | 3 | 9 | | | 1 | 1 | 10 |
| Yuba | 38 | 3 | 9 | 50 | 27 | 5 | 1 | 33 | 83 |
| Totals | 4,112 | 1,194 | 1,704 | 7,010 | 4,462 | 1,459 | 3,239 | 9,160 | 16,170 |

| | 1946-47 | 1947-48 |
|---|---|---|
| Average number of trappers | 26 | 28 |
| Miles of trapline | 454,892 | 470,115 |
| Number of sets | 451,217 | 498,103 |
| Number of days | 8,288 | 9,627 |

# GAME BIRD RELEASES

## LIBERATION OF GAME FARM BIRDS, JANUARY 1, 1946

### Through December 31, 1947

| County | Ringneck | Reeves | Turkey | Chukar | Valley quail | Total |
|---|---|---|---|---|---|---|
| 1. Alameda | 857 | | | | | 857 |
| 2. Alpine | | | | | | |
| 3. Amador | 542 | 2 | | 155 | 6 | 705 |
| 4. Butte | 4,294 | | | 150 | | 4,444 |
| 5. Calaveras | | | | | | |
| 6. Colusa | 967 | | | | | 967 |
| 7. Contra Costa | 2,573 | | | 63 | | 2,636 |
| 8. Del Norte | | | | | | |
| 9. El Dorado | | 16 | | | | 16 |
| 10. Fresno | 4,357 | | | 386 | | 4,743 |
| 11. Glenn | 3,594 | | | | | 3,594 |
| 12. Humboldt | 834 | | | 5 | | 839 |
| 13. Imperial | 5,131 | | | 128 | | 5,259 |
| 14. Inyo | 4,532 | | | 214 | | 4,746 |
| 15. Kern | 7,080 | | 40 | 582 | 200 | 7,902 |
| 16. Kings | 1,644 | | | | 65 | 1,709 |
| 17. Lake | 494 | | | | | 494 |
| 18. Lassen | 2,003 | | | | | 2,003 |
| 19. Los Angeles | 1,029 | | | 1,428 | 55 | 2,512 |
| 20. Madera | 432 | | | | | 432 |
| 21. Marin | 1,243 | | | | | 1,243 |
| 22. Mariposa | | 108 | | | | 108 |
| 23. Mendocino | 940 | | | 150 | | 1,090 |
| 24. Merced | 5,280 | | | 171 | | 5,451 |
| 25. Modoc | 3,997 | | | 165 | | 4,162 |
| 26. Mono | 188 | | | 60 | | 248 |
| 27. Monterey | 164 | | | | | 164 |
| 28. Napa | 2,567 | 23 | | | 29 | 2,619 |
| 29. Nevada | | | | | | |
| 30. Orange | 768 | | | 21 | | 789 |
| 31. Placer | 283 | | | 374 | | 657 |
| 32. Plumas | 173 | | | 36 | | 209 |
| 33. Riverside | 2,614 | 358 | 61 | 1,079 | 36 | 4,148 |
| 34. Sacramento | 1,736 | | | 16 | 19 | 1,771 |
| 35. San Benito | 18 | | 24 | 12 | | 54 |
| 36. San Bernardino | 2,603 | | 34 | 2,068 | | 4,705 |
| 37. San Diego | 1,428 | | | 1,354 | 130 | 2,912 |
| 38. San Francisco | | | | | | |
| 39. San Joaquin | 5,419 | | | | | 5,419 |
| 40. San Luis Obispo | 165 | 112 | 44 | 440 | 93 | 854 |
| 41. San Mateo | | | | | | |
| 42. Santa Barbara | 1,411 | 29 | 30 | 50 | | 1,520 |
| 43. Santa Clara | 744 | 50 | 54 | | | 848 |
| 44. Santa Cruz | 513 | 15 | | | | 528 |
| 45. Shasta | 2,632 | 112 | | 486 | | 3,230 |
| 46. Sierra | 1,139 | 212 | | 36 | | 1,387 |
| 47. Siskiyou | 2,896 | | | 57 | | 2,953 |
| 48. Solano | 4,140 | | 18 | 2 | 34 | 4,194 |
| 49. Sonoma | 1,395 | | 48 | | | 1,443 |
| 50. Stanislaus | 3,405 | 44 | | | 12 | 3,461 |
| 51. Sutter | 274 | | | | | 274 |
| 52. Tehama | 2,093 | 152 | | | | 2,245 |
| 53. Trinity | | | | | | |
| 54. Tulare | 7,075 | | | 242 | | 7,317 |
| 55. Tuolumne | 383 | 45 | | 129 | 23 | 580 |
| 56. Ventura | 1,834 | | | 979 | | 2,813 |
| 57. Yolo | 1,760 | | | 28 | | 1,788 |
| 58. Yuba | 590 | | | | | 590 |
| Totals | 102,233 | 1,278 | 353 | 11,066 | 702 | 115,632 |

o

16763 10-49 6500